RAILROAD GAZETTE

FRIDAY, OCTOBER 30, 1896.

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Contributions.

Car Wheels, the Heat Test and Hot Boxes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have carefully read the editorials in reference to test of wheels at Altoona. I should judge that these tests would be of great value, as I have for a long time thought that the drop test did not reveal the true merits of the wheel. I should also be glad to have tests made with a view to finding out what effect a hot box has on the wheel. When a wheel has been applied at, say, 40 tons pressure, would not the pressure from a hot axle be sufficient to crack the plate of the wheel? Reclamations of this kind are made on car wheel makers, when I believe that the fault is with the journal getting hot. If any tests have been made of this kind I am not aware of it. I should like to be advised on this subject.

WHEEL MAKER.

Another wheel maker writes: "We had heard something of the experiments that were being made at Altoona, and we have made some experiments ourselves, but have not gone far enough to put us in position to say anything on this matter for publication. It is our opinion, however, that it is perfectly feasible to make car wheels that will stand this test, and it is mainly a question of using a good quality of iron in the mixture, though of course a proper handling of the iron is also important. We are intending to follow up this matter, with some further trials ourselves, and possibly later we may be better prepared to say something more about it."

The Erie Railroad in 1851.

Michigan Central Railroad Company,
NEW YORK, Oct. 23, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have this morning read in the *Railroad Gazette* the copy of the poster of the Erie Railroad, first issued in May, 1851, when that prince of superintendents, Charles Minot, was General Superintendent, and the veteran freight man, Jerry Nottingham, was Agent at Dunkirk. I have no doubt that as a young lad I looked upon with wonder, and read, many of these posters, inasmuch as at that time I was living at Dunkirk; but I write now more especially to call your attention to the fact that possibly a little later than this date, and after the "Erie" had become somewhat better established and organized, it broke all the then existing records by running a rapid through train between New York and Dunkirk. I remember distinctly the flaring headlines at the top of the poster "THROUGH BY DAYLIGHT," followed with the announcement that in the enjoyment of the healthfulness of the early morning air, and with the bright beams of the rising sun just peeping over the eastern horizon, a trainload of delighted passengers was pulling out of Dunkirk about 4 or 4:30 a. m., bound for New York. This was the schedule in the summer months while the days were long. The advertisement also described the evening on the arrival of the train at New York. The delightful journey was finished, and the passengers beheld the lingering rays of the setting sun upon the gilded spires of New York City. This was a peculiarly attractive poster for that early day, and I have thought that possibly you might obtain a copy from some of the records of the Erie, and publish it in your paper. The two posters, if you could reproduce the second, would be pleasing to many railroad people. At that time Mr. Horatio G. Brooks, whom you mention, was my father's next door neighbor, and as a lad I knew him very well. Afterward, and when Jerry Nottingham had resigned the agency, and had become the General Freight Agent of the old Michigan Southern & Northern Indiana, I entered the service of the Erie in the local freight office; hence the pleasing recollections aroused by the publishing of this old advertisement.

D. A. WATERMAN.

Train Accidents in the United States in September.

COLLISIONS.

REAR.

6th, on Cleveland, Cincinnati, Chicago & St. Louis, near Lafayette, Ind., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking several cars. A man stealing a ride was injured.

8th, on Pittsburgh, Fort Wayne & Chicago, near Beaver, Pa., a freight train broke in two and the rear portion afterward ran into the forward one, making a bad wreck. Two tramps were killed.

14th, on Ohio Southern, at Springfield, O., a freight train ran over a misplaced switch and into some cars standing on a side track, making a bad wreck. Three employees were injured.

27th, on Rome, Watertown & Ogdensburg, near Rice's, N. Y., an engine carrying passengers ran into the rear of a preceding freight, doing slight damage. Two of the passengers were injured.

28th, 7 a. m., on Florida Central & Peninsular, at Sadie, Fla., a passenger train ran over a misplaced switch and into a freight car standing on the side track. The engineman was injured.

29th, on Louisville & Nashville, near Saginaw, Ala., a freight train ran into the rear of a preceding freight, wrecking several cars; engineman and fireman injured.

30th, on Lehigh Valley, near Batavia, N. Y., an eastbound freight train ran into the rear of a preceding freight, wrecking several cars, which fell upon the westbound track; a westbound freight train came along a moment later, and, striking the wreck, the engine was overturned. The wind was blowing a gale and some of the cars caught fire. The fire resisted all efforts to extinguish it for hours. A brakeman was killed and one engineman badly injured.

And 13 others on 11 roads, involving 3 passenger and 15 freight and other trains.

BUTTING.

5th, on Illinois Central, near Jackson, Miss., butting collision of freight trains, wrecking both engines and several cars. One engineman was killed and 3 other trainmen were injured.

8th, on Boston & Albany, near Barrett's Junction, Mass., butting collision between a passenger train and an empty engine; one passenger injured. It is said that the runner of the empty engine made a mistake in reading his order.

9th, on Erie, at Enon, O., butting collision between a passenger train and a freight, damaging both engines; engineman and one passenger injured. The engineman of the freight had lost his bearings in consequence of the presence of smoke in the atmosphere and ran past the switch at a point where he should have taken the side track; and in addition to this he was encroaching a little on the time of the passenger train.

16th, 3 a. m., on Detroit, Lansing & Northern, at Fowlerville, Mich., an eastbound freight train standing at the station was run into by a westbound freight, wrecking both engines and several cars. One engineman was killed and the other engineman and both firemen were injured.

17th, on Georgia Railroad, near Haddock's, Ga., butting collision between a mixed train and some runaway freight cars, making a bad wreck: fireman injured.

17th, on Louisville & Nasnville, at Columbia, Tenn., butting collision between a freight train and an empty engine, derailing 3 cars. A brakeman was killed.

18th, on Cincinnati, Hamilton & Dayton, near Longwood, Ind., butting collision between a pay-car train and a freight engine running backward, making a bad wreck. Three employees were killed and 10 injured. The freight train, No. 95, had been stalled on a grade and had gone forward with a part of the train to Salters, about three miles east of the point of collision. After leaving this part on the side track at that station the engine returned for the other part, which had been left on the side track at Longwood, and on this return trip met the pay car in a cut on a sharp curve. The whole of the crew of the freight train was on the engine and no signal of any kind had been sent or posted to warn the pay-car train.

19th, on Georgia Railroad, near Mesena, Ga., butting collision between passenger trains, making a bad wreck. Four trainmen were injured. It is said that the engineman of one of the trains forgot an order directing him to stop at Mesena.

20th, on Montana Union, near Rocker, Mont., butting collision between a passenger and a mixed train, wrecking both engines and two or three cars. Three trainmen and 7 passengers were injured. The collision was due to a mistake in issuing telegraphic orders.

21st, on Erie road, near Meadville, Pa., butting collision of freight trains, making a bad wreck. Two tramps were killed.

24th, on Mobile & Ohio, at Trenton, Tenn., butting collision of freight trains, wrecking both engines and 12 cars. One engineman was fatally injured. It is said that the northbound train ran past an appointed meeting place.

26th, on Philadelphia & Reading, near Mooresburg, Pa., butting collision between a coal train and an empty engine, wrecking both engines and 15 cars. Three employees were killed. It is said that the runner of the empty engine disregarded a meeting order.

And 2 others involving 4 freight trains.

CROSSING AND MISCELLANEOUS.

13th, on Chicago & North Western, at Elroy, Wis., a passenger train ran into some freight cars and the engine was overturned. The engineman was injured.

15th, on Pennsylvania road, at Allegrippus, Pa., 25 cars broke away from a freight train ascending a steep grade and ran back about one mile into the head of a following freight, wrecking the engine and several cars.

17th, On Pennsylvania road, near Perkiomen, Pa., a passenger train ran into a freight train which was backing into a side track, wrecking one car. The engineman was injured.

17th, at Mahoney City, Pa., a passenger train of the Lehigh Valley road ran into an engine of the Philadelphia & Reading at the crossing of the two roads, making a bad wreck. One engineman was killed and 4 trainmen and 8 passengers were injured.

18th, 4 a. m., on Delaware, Lackawanna & Western near Great Bend, Pa., several cars of a freight train ascending a grade broke from the train and ran back into the head of a following freight, killing the engineman. There was a dense fog at the time.

20th, on Delaware & Hudson, at Menands, N. Y., a passenger train ran into a freight which was backing into a siding and the engine fell into the ditch. The fireman was injured.

24th, on Baltimore & Ohio, at Rowlesburg, W. Va., an empty engine running backward was run into by a passenger train and both engines were badly damaged. The engineman and fireman of the passenger train were injured, and an employee on the ground, who saw that a collision was imminent and ran to notify the runner of the empty engine, was killed. The empty engine, after the collision, ran three miles up the mountain unattended.

And 4 others on 4 roads, involving 7 freight trains.

DERAILMENTS.

DEFECTS OF ROAD.

6th, on Louisville, Evansville & St. Louis, at Taswell Ind., an excursion train of 11 cars was derailed and 4 cars were ditched, 2 of them being overturned. Six passengers were injured. 2 of them fatally, and 50 or more were slightly injured. It is said that the derailment was due to a defect in the track.

13th, on Arcata & Mad River, near Arcata, Cal., a passenger train broke through a bridge and fell 30 ft. to the bed of the shallow stream below, being completely wrecked. There were in the train over 30 passengers, only one of whom succeeded in escaping before the cars fell. Two were killed and 5 more fatally injured. The rest were less seriously hurt. One employee was killed and 3 injured.

DEFECTS OF EQUIPMENT.

2d, on New York Central & Hudson River, near Little Falls, N. Y., a freight train broke in two and 9 cars of the rear portion were derailed by the sudden stoppage of that part of the train by the automatic application of the air-brakes.

7th, on Baltimore & Ohio, at Babcock, Ind., a freight train was derailed by a broken axle and 16 cars were wrecked. Three tramps were killed.

18th, on Pennsylvania road, near Lancaster, Pa., a freight train was derailed by a broken axle and 21 cars were wrecked; one brakeman and one tramp injured.

23d, on Baltimore & Ohio Southwestern, near Athens, O., a passenger train was derailed by the breaking of a wheel-flange and one car was overturned. Six passengers were injured.

26th, on Jacksonville & St. Louis, near Waverly, Ill., a passenger train of the Chicago, Peoria & St. Louis was derailed by a broken axle and one car was overturned. Three passengers were injured.

27th, on Baltimore & Ohio, near Riverdale Park, Md., a freight train was derailed by the breaking of an axle and 9 cars were wrecked. A brakeman was killed.

And 8 others on 5 roads, involving 8 freight trains.

NEGLIGENCE IN OPERATING.

7th, on Kansas City, Osceola & Southern, near Clinton, Mo., an engine carrying men to extinguish the fire at a burning trestle became uncontrollable and dashed into the fire, falling 25 ft. to the ground below. The engineman and one other man were killed.

8th, 11 p. m., on Baltimore & Ohio, at Bloomington, Md., a freight train became uncontrollable while descending a steep grade and the engine and 20 cars were derailed and ditched, most of the cars being wrecked. A tramp was killed. In consequence of danger from a hot box the conductor ordered the train stopped at a point where the grade was about 117 ft. per mile, but in trying to do so the engineman reversed his engine and blew out a cylinder head. This impaired his control over the train, so that he was unable to check its speed.

9th, 3 a. m., on Seaboard Air Line, at Hull, Ga., a freight train was derailed and the engine and 4 cars were ditched; engineer and fireman injured. It is said that the derailment was due to a misplaced switch.

15th, 4 a. m., on Louisville & Nashville, at Paris, Tenn., the rear car of a passenger train was derailed by the premature throwing of a switch, as the train was leaving the station, and fell down a bank. One brakeman was injured.

28th, on Missouri, Kansas & Texas, at Wilton, Mo., a freight train was derailed by a misplaced switch and the engine was overturned. The fireman was killed.

And 5 others on 5 roads, involving 1 passenger train and 4 freight trains.

UNFORESEEN OBSTRUCTIONS.

1st, on Chicago & North Western, at North Evanston, Ill., a passenger train was derailed by a spike lying on the track, probably placed there by a child. The engineman was killed and the fireman and 2 passengers were injured.

6th, 2 a. m., on West Shore road, near West Point, N. Y., a freight train was derailed by a landslide and the engine and 4 cars were wrecked. The engineman and fireman were injured.

18th, on Central of Georgia, near Howard's, Ga., a passenger train was derailed by a misplaced switch and the engine and baggage car were ditched. The fireman was injured. It is said that the switch had been maliciously misplaced.

30th, on Delaware, Lackawanna & Western, at Messengerville, N. Y., a passenger train was derailed by a tree which had been blown across the track, doing considerable damage. The fireman was killed.

And 4 others on 4 roads, involving 3 passenger trains and 1 freight.

UNEXPLAINED.

3d, on Pennsylvania road, near Tyrone, Pa., a freight train was derailed and 5 loaded cars fell down a bank. Two brakemen were injured.

4th, on Northern Pacific, near Bozeman, Mont., a work-train was derailed and wrecked; one employee was killed and 5 injured, two of them fatally.

7th, on Pittsburgh, Shenango & Lake Erie, near Greenville, Pa., a work-train was derailed and the conductor was killed.

9th, on Pittsburgh, Chartiers & Youghiogheny, near Carnegie, Pa., the locomotive of a freight train was derailed, and, with 7 cars, fell down a bank. Four employees were injured.

10th, on Mobile & Ohio, at Guntown, Miss., a freight train was derailed and 16 cars were wrecked. A man stealing a ride was killed and another one injured.

14th, on Southern Railway, near Atlanta, Ga., a freight train was derailed and 4 cars were wrecked. A tramp was killed.

15th, on Delaware, Susquehanna & Schuylkill, at Harwood, Pa., a freight train was derailed and the engine and 6 cars fell down a bank; conductor and fireman injured.

21st, on Pittsburgh, Shenango & Lake Erie, at Grove City, Pa., a freight train was derailed and several cars fell down a bank; 3 trainmen injured, one of them fatally.

22d, on South Atlantic & Ohio, near Mendota, Va., a mixed train was derailed and the engine and 4 cars fell down a bank; one brakeman was injured.

25th, on Chicago, Burlington & Quincy, at Fourteenth street, Chicago, several cars in a freight train were derailed. The engineman was injured by jumping

23th, on Baltimore & Ohio, at Brady's, Md., a freight train was derailed and 14 cars, mostly loaded with oil, were wrecked. A fireman learning the road, and a brakeman, were killed. A car in the train loaded with giant powder was overturned.

30th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Pittsburgh, Pa., the engine of a freight train was derailed and the engineman was killed.

And 18 others on 12 roads, involving 2 passenger and 6 freight and other trains.

OTHER ACCIDENTS.

6th, on Central of Georgia, at Augusta, Ga., a locomotive, just out of the shops after being repaired, and making a trial trip, was wrecked by the explosion of its boiler. Four employees were injured, one of them fatally.

10th, on Chicago & Eastern Illinois, at Wellington's, Ill., an oil tank car in a freight train exploded, setting fire to surrouding cars and buildings; 24 loaded cars and a store house containing 20,000 bushels of grain were burned up. Four tramps were burned to death.

10th, on Lake Shore & Michigan Southern, near Goshen, Ind., an express car in an express train took fire and a large portion of the contents, including some mail bags, was burned up.

22d, on Cleveland, Cincinnati, Chicago & St Louis, at Pekin, Ill., the engine of a freight train was wrecked by the explosion of its boiler; fireman killed.

And 3 others, involving 1 passenger train and 2 freight trains.

A summary will be found in another column.

Improved Inside Check Valve.

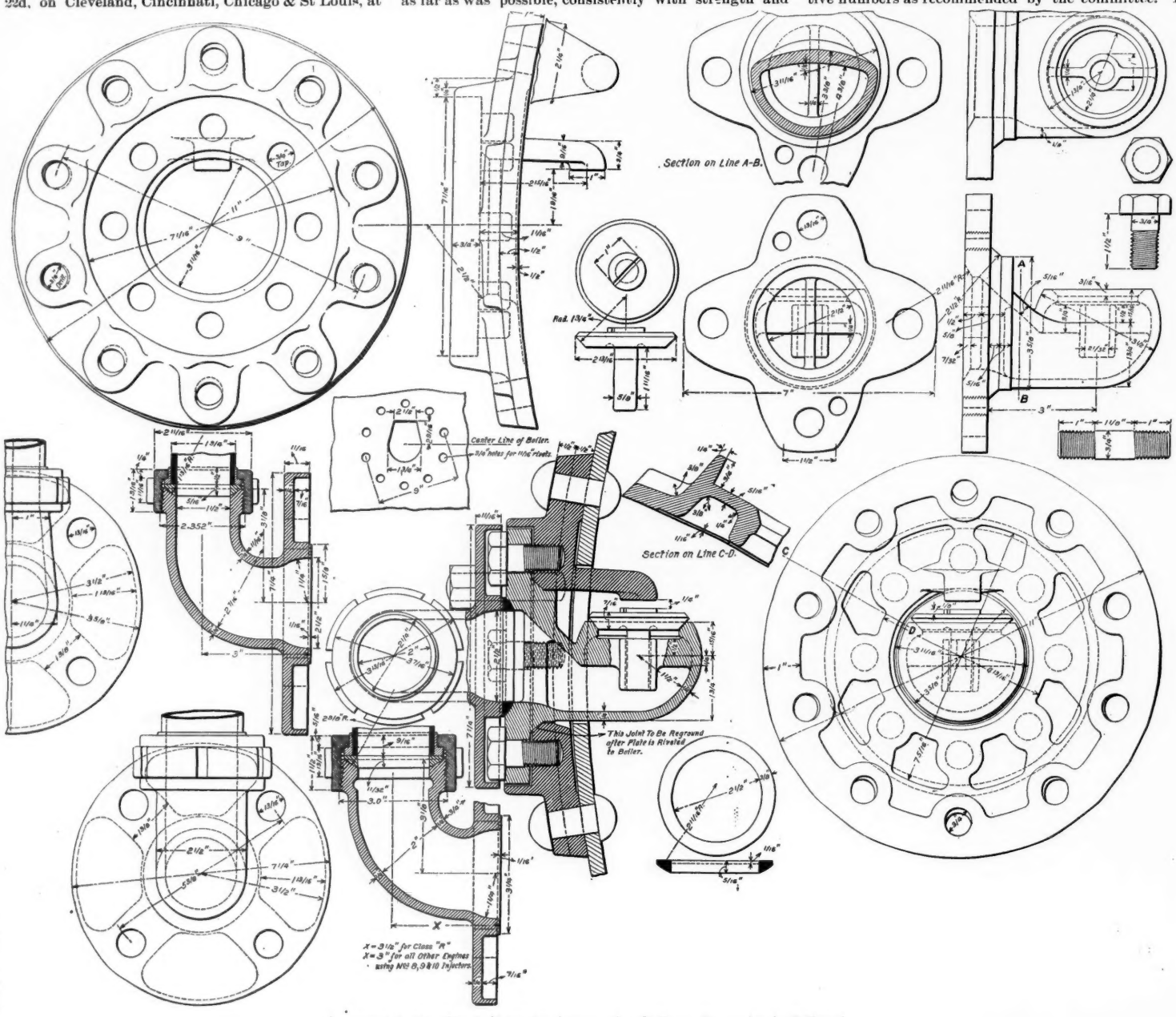
The check valve for locomotive boilers shown in the accompanying illustration was designed and patented by Mr. William Wright, chief draftsman of the Pennsylvania Railroad, at Altoona, and is being applied to all the company's locomotives as fast as practicable. For some years past, this road has been using inside checks, to avoid the danger of escaping steam when an outside check valve is stripped off in a collision; but there were certain defects in those heretofore used that seem to be entirely corrected in this one.

It will be observed that there is a flange riveted to the boiler, with the front face recessed to receive a flanged valve-casing projecting into the boiler, and carrying the valve proper. The inner face of the plate has a finger-like projection extending into the boiler, and over the top of the check valve, which acts as a stop to the vertical lift (¼ inch) of the valve from its seat. The valve-casing is securely fastened to the riveted flange by four tap bolts, over which is placed the elbow, to which the injector delivery pipe is attached, also secured to the riveted flange by four studs.

The flange on the elbow projects slightly into the boiler jacket, in order to make a good finish, and when taken off, the valve-casing can be drawn out through the opening in the jacket, made for the flange of this elbow, without disturbing or removing it, as formerly had to be done with the old types.

The most important point claimed for the valve is that it has a truly vertical life from its seat to the stop or projecting finger. When the injector is shut off the valve returns to its seat by gravity only, as, on account of the check line of the injector, the pressure is equal above and below the main check valve. With the hinged valve formerly used, scale and sediment accumulated in a short time and prevented it from seating properly, interfering particularly with the hinge. This caused much trouble and owing to the construction of the old type of valve it was a difficult matter to regrind it so as to fit its seat properly.

This valve is made of brass, except the studs, bolts and nuts, and the amount of material in it has been reduced as far as was possible, consistently with strength and good mechanical construction. That portion of it that could possibly be dangerous in case of a collision is very solidly fastened to the boiler, is inside of it, and the only portion outside is the pipe elbow, which is made very light at its junction with the flange, so as to readily give way at that point in case of accident. The uniform lift of every portion of the valve from its seat insures a thorough washing of the same by the flow of water past it and reduces the deposit of sediment to a minimum.


Section on Line A-B.
Section on Line C-D.
Center Line of Boiler.
This Joint To Be Reground after Plate is Riveted to Boiler.
X = 3½" for Class "R"
X = 3" for all Other Engines using Nos 8, 9 & 10 Injectors.

Improved Inside Check Valve for Locomotive Boilers—Pennsylvania Railroad.

The Association of Superintendents of Bridges and Buildings.

The Sixth Annual Convention of the Association of Railway Superintendents of Bridges and Buildings was held at Chicago, Ill., from Tuesday, Oct. 20, to Thursday, Oct. 22. The opening exercises consisted of a speech of welcome by a representative of the Mayor of Chicago, which was responded to by Mr. W. A. McGonagle, of the Duluth & Iron Range, President of the Association. There were 35 members in attendance, in addition to a large number of invited guests and railroad officers. After sundry routine business, election of 20 new members, President's address, reports of Secretary and Treasurer, communications, appointment of committees, etc., committee reports on the following subjects were presented:

Different Methods of Numbering Bridges. Should all Waterways be Numbered?

Drawbridge Ends, Methods of Locking; and under this head include Locking of Turntables.

Protection of Trestles from Fire, including Methods of Construction.

Local Stations for Small Towns and Villages, giving Plans of Buildings and Platforms.

Tanks, Size, Style and Details of Construction, including Frost-proof protection to Tank and Pipes.

Best and Uniform System of Report Blanks for Bridge and Building Department.

Mechanical Action and Resultant Effects of Motive Power at High Speed on Bridges.

Best and Most Economical Railroad Track Pile-Driver.

Span Limits for Different Classes of Iron Bridges, and Comparative Merits of Plate Girder and Lattice Bridges for Spans from 50 to 110 ft.

The resulting discussions on these subjects were quite extended and brought out much valuable information. In regard to numbering bridges the majority of the members favored the mileage system in place of consecutive numbers as recommended by the committee. The report of the Committee on Local Stations was accompanied by a large number of drawings, which will be embodied in the proceedings. Preference was expressed for the single waiting-room system at small local stations. The discussion on water tanks was participated in by about a score of the members, and the question of the best railroad track pile-driver brought out much practical experience.

The discussions of last year's subjects embraced the questions of the mechanical action of motive power at high speed on bridges; methods for building temporary trestles over wash-outs and burn-outs; strength of timber for trestles and bridges; erecting plate-girder bridges; sandhouses; spanning low wide culvert openings in embankments, and pumps and boilers.

Denver was selected as the next place of meeting, in October, 1897, in competition with Niagara Falls, Chattanooga and Detroit.

The new officers were as follows: *President*, James Stannard, Wabash, Moberly, Mo.; *First Vice-President*, Walter G. Berg, Lehigh Valley, Jersey City, N. J.; *Second Vice-President*, Jos. H. Cummin, Long Island, Long Island City, N. Y.; *Third Vice-President*, Aaron S. Markley, Chicago & Eastern Illinois, Danville, Ill.; *Fourth Vice-President*, R. M. Peck, Missouri Pacific, Pacific, Mo.; *Secretary*, S. F. Patterson, Boston & Maine Concord, N. H.; *Treasurer*, N. W. Thompson

Pittsburgh, Fort Wayne & Chicago, Fort Wayne, Ind.; *Executive Members*, W. O. Eggleston, Chicago & Erie; W. M. Noon, Duluth, South Shore & Atlantic; Jos. M. Staten, Chesapeake & Ohio; G. J. Bishop, Chicago, Rock Island & Pacific; C. P. Austin, Boston & Maine; M. Riney, Chicago & Northwestern.

The following subjects were selected for next year:

1. Methods of Heating Buildings where three or more Stoves are now Used.
2. The most Suitable Material for Roofs of Buildings of all kinds.
3. Roundhouse Construction, including Smoke-Jacks and Ventilators.
4. Care of Iron Bridges after Erection.
5. How to Determine Size and Capacity of Openings for Waterways.
6. Protection of Railroad Buildings and Other Structures from Fire.
7. Designs for Icehouses.
8. Best End Construction for Trestles Adjoining Embankments.
9. Bridge Warnings for Low Overhead Structures.
10. Stockyards and stock-sheds, including all details of construction.
11. Floor system on bridges, including skew bridges.

On Thursday afternoon the members visited the Burnside shops of the Illinois Central and the Pullman shops at Pullman. On Friday a very interesting trip was made over the Chicago Drainage Canal.

The following supply houses had representatives and exhibits at the convention: The Sherwin-Williams Co., of Cleveland, Chicago and New York; the Patterson-Sargent Co., Cleveland; Fairbanks, Morse & Co., Chicago; Stilwell-Bierce & Smith-Vaile Co., Dayton, O.; U. S. Wind Engine & Pump Co., Batavia, Ill.; Morris & Wait, bridge contractors, Chicago; F. C. Wells, steam pumps, Chicago; F. A. Ingalls, representing the Buda Foundry & Manufacturing Co., Harvey, Ill.; Bogue & Mills Manufacturing Co., Chicago.

Passenger Locomotives, Chicago & Grand Trunk Railway.

We illustrate one of the new Class B, eight-wheel passenger engines built by the Cooke Locomotive & Machine Co., for the Chicago & Grand Trunk Railway. The Class B engines are being used in heavy, fast, passenger service, and the performances have been very satisfactory.

The engine shown has a total weight when in working order of 120,437 lbs., 79,820 lbs. being on the drivers, with a driving wheel base of 8 ft. 9 in. and 73-in. driving wheels. The boiler is of the straight barrel type built of $\frac{7}{16}$-in. Carnegie steel, and is 60 in. in diameter at the front end, the working steam pressure being 180 lbs. The firebox is of $\frac{5}{16}$-in. Otis steel, 118⅜ in. long by 41¼ in. wide, the depth being 64 in. at the front end and 55¾ in. at the back end; it is supplied with a brick arch, supported on water tubes. The crown sheet is held by 1⅛-in. radial stays. The total heating surface is 1,222.3 sq. ft.

The tender has a coal capacity of 10 tons, and a water capacity of 3,800 gallons. The tender trucks are of the rigid four-wheel type with center and side bearings, and are built for a carrying capacity of 60,000 lbs. The truck frames are of the diamond pattern with elliptical springs. The tank is of $\frac{1}{16}$ in. tank steel.

The tires were furnished by the Midvale Steel Co., the driver and tender brake equipment by the Westinghouse Air Brake Co., the engine and tender truck springs by the A. French Spring Co., and the steam heat equipment by the Consolidated Car Heating Co. The engine is supplied with a Detroit triple sight-feed lubricator, two metropolitan injectors Nos. 8 and 9, Utica steam gage, Richardson's latest safety valve and Cooke & Strong bell ringer. It also has a 9½-in. Westinghouse air pump and governor. The Ross-Meehan brakeshoes are used on the driver and Congdon brakeshoes on the tender wheels, the brake-heads being of the Christie pattern.

The general dimensions of the engine and tender are as follows:

Description and General Dimensions.

Gage of road	4 ft. 8½ in.
Type of engine	Simple
Weight on drivers	79,820 lbs.
Weight on truck	40,617 lbs.
Total weight	120,437 lbs.
Total wheel base of engine	23 ft. 2¼ in.
Driving wheel base	8 ft. 9 in.
Total wheel base of engine and tender	50 ft. 2⅜ in.
Length over all, engine and tender	60 ft. 10⅜ in.
Height above rails, center of boiler	8 ft. 2 in.
Height above rails, top of stack	14 ft. 9 in.
Heating surface, firebox	147.3 sq. ft.
Heating surface, tubes	1,075 sq. ft.
Heating surface, total	1,222.3 sq. ft.
Grate area	33.9 sq. ft.

Wheels and Journals.

Drivers, number	4
" steel tired, Mansell fastenings	73 in. dia.
Truck wheels, steel tired, Mansell fastenings	34 in. dia.
Journals, driving axles	8¾ × 8 in.
" truck "	5 × 8 in.
Main crank pins	4 × 4¼ in.

Cylinders.

Cylinders, diameter	18 in.
Piston, stroke	24 in.
" rod, diameter	3⅜ in.
Main rod, length center to center	7 ft. 4¾ in.
Steam port, length	18 in.
" " width	1¼ in.
Exhaust ports, length	18 in.
" " width	3 in.
Bridge, width	1¼ in.

Valves.

Kind of	Balanced
Greatest travel	5½ in.
Outside lap	⅞ in.
Inside lap	0
Lead in full gear	$\frac{5}{16}$ in.

Boiler.

Type	Straight barrel
Working steam pressure	180 lbs.
Material of barrel	Carnegie steel
Thickness of material in barrel	$\frac{7}{16}$ in.
Diameter of barrel, front sheet, outside	60 in.
Horizontal seams	Butt joints with inside and outside welt strips.
Circumferential seams of barrel	Butt-jointed, with wrought-iron rings on outside, bored to fit, and riveted.
Thickness of tube sheet	½ in.
Thickness of crownsheet	⅜ in.
Crownsheet stays, radial	1⅛ in.
Dome, inside diameter	29 in.
Height	28 in.
Thickness of material	½ in.

Tubes.

Number	190
Outside diameter	2 in.
Length over sheets	12 ft.

Firebox.

Length	118⅜ in.
Width	41¼ in.
Depth, front	64 in.
Depth, back	55¾ in.
Material	Otis steel
" thickness	⅜ in.
Brick arch, supported on tubes:	
Water space	front, 5 in.; sides, 3½ in.; back, 4 in.

Smokebox.

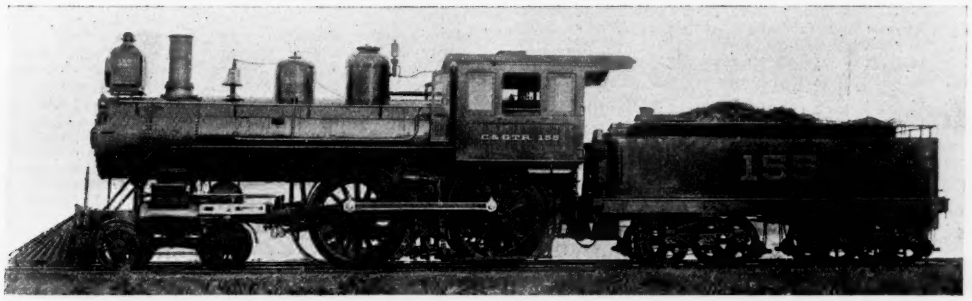
Diameter	61 in.
Length from tube sheet to end	76 in.

Other Parts.

Exhaust nozzle	Single
Exhaust nozzle, diameter	4⅛ in.
" " distance of tip above center of boiler	10⅞ in.
Wire, netting or plate	Netting
Smokestack	Straight
" diameter, least	17⅛ in.
" diameter, greatest	17⅛ in.
" height above smokebox	48½ in.

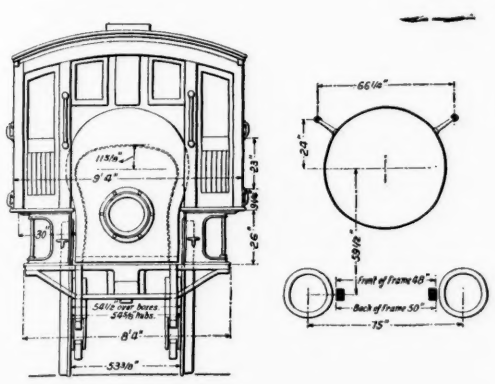
Tender.

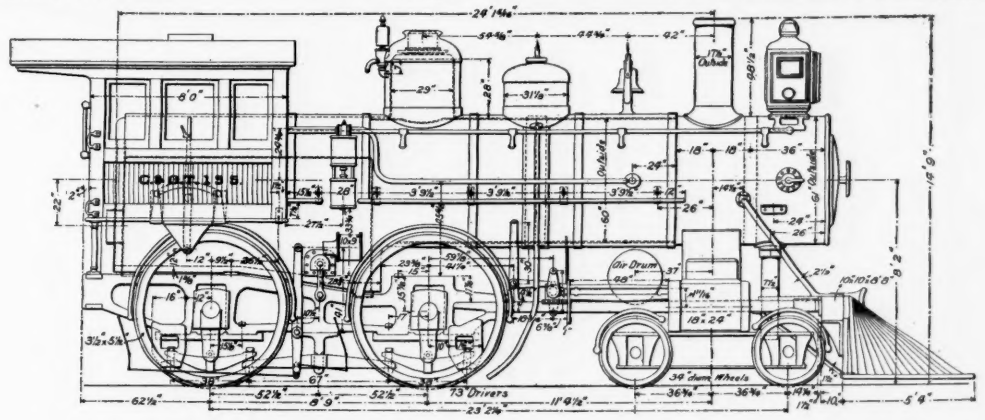
Type	Side and center bearing.
Truck, carrying capacity	60,000 lbs.
Axles	6 ft. 3 in. centers
Capacity of tank, water	3,800 U. S. gals.
Capacity of tank, coal	10 tons
Material	Tank steel
Thickness of material	$\frac{5}{16}$ in.
Type of underframe	White oak
Type of truck	Rigid
Truck springs	Elliptical
Truck wheels	Steel-tired, Mansell fastenings
" " diameter	31 in.
Journals	4¼ × 8 in.
Length of axles, center to center	6 ft. 3 in.
Diameter of wheel fit on axle	5¼ in.
Diameter of center of axle	4⅝ in.
Type of truck bolster	Oak
Type of truck transom	Oak
Length of tender frame over bumpers	25 ft.
Length of tank	22 ft.
Width of tank	8 ft. 6 in.
Height of tank	46 in.



Passenger Locomotive—Chicago & Grand Trunk Railway.

Mr. F. W. MORSE, *Superintendent Motive Power. Built by the* COOKE LOCOMOTIVE & MACHINE COMPANY, *Paterson, N. J.*





Grand Trunk Passenger Locomotive.

The Modern Power-House.*

BY RICHARD MCCULLOCH.

It may be readily seen that there are two standpoints from which the design of the power-house may be viewed. That of the one which strives that, in general, each machine and every arrangement shall tend slowly toward the cheapest possible production of power; and that of the other, while appreciating the position of the former, desires also that nothing shall enter into the design which will materially affect either the simplicity or the reliability of the plant. The cost of power on a large road is about 10 per cent. of the total operating expenses, and it is almost a self-evident fact that the use of any apparatus which might produce unreliable service and thus impair the receipts and ruin the prestige of the road in order to save a small percentage of this cost of power would be very bad business policy. The first criterion of any machine installed in a power-house should be absolute reliability, and the second, economy.

Location.—A great deal has been written lately concerning the proper location of power-houses and formulæ and graphical methods for determining this point have been derived, but we doubt very much whether any street railroad power-house has ever been located either by graphics or by the differential calculus. Unfortunately it usually happens, especially in cities, that the electrical center of the distribution system falls in very valuable ground entirely unsuited for a power-house location and the final location is very often influenced by the extremely unscientific fact that the railroad company owns that particular piece of ground and cannot find a purchaser for it. In selecting a location it is very important that a large power-house should be placed on a railroad track so that coal may be readily and cheaply delivered, and it is very desirable that the location should also be on some water supply in order that condensing engines may be used, unless the conditions will warrant the use of self-cooling condensers. If a location fulfilling these conditions may be found somewhere near the electrical center of distribution it is an ideal spot for a power-house, but if in order to secure coal and water it must be moved from this point it should, if possible, be moved in the direction of future extensions of the street railroads. There are cases where power-houses cannot be located on the steam railroad tracks, but the only excuse for such a location is where the interest on the cost of copper feeders running from the steam railroad tracks to the center of distribution would greatly exceed the cost of hauling coal in wagons.

Building.—The main points which should be borne in mind in the design of the building are that it should be light, airy, compact and fireproof. The shape and size of the building will be largely governed by local conditions, but there is one general arrangement which has been adopted in a number of the most recent power-houses. This will be discussed later. There is no reason why anything combustible should enter into the construction of a power-house. The walls may be brick, the roof of slate, tile or iron, and the floors of concrete or iron. This method of construction not only increases security against fire, but it obviates the necessity of carrying insurance, the saving of which will in a few years pay the extra first cost. The building should be substantially constructed, but unless the location is on an important street there is no necessity of going to great expense to render the building ornamental, especially as all money which can be spared for this purpose may be far better invested in machinery to put inside the building. In erecting a building for use as a power-house it is advisable to decide first on the style, size and arrangement of the machinery, so that no part of the building will interfere with the proper repairs, renewals and inspection of the apparatus. This may seem unnecessary advice, but it is a very common oversight for railroad companies first to decide on the style of building they wish, then let the contract for the erection of the power-house building, and then find themselves hampered in the use of some particularly desirable form of apparatus by the shape or contracted area of their buildings.

* Presented at the St. Louis meeting of the American Street Railway Association, Oct. 20-23 1896.

As by far the greater number of the modern railroad power stations are operated by steam power, steam alone will be considered in this article. For convenience in discussion, the apparatus in a power station may be divided into three classes: (1.) The steam generating part, consisting of the boilers, pipes and all their accessories, such as coal and ash conveyors, mechanical stokers, stacks, economizers, feed-water heaters, pumps, etc. (2.) The steam-consuming part, consisting of the engines, steam separators, oiling devices, condensers, etc (3.) The electric part, consisting of the dynamos, cables, switchboard, electrical instruments, etc. The division between the first and second parts is more easy and more marked as it is usually accentuated in the power-house itself by means of a brick wall.

Steam Generating Apparatus.—Beginning with what we have called the first part, we start with the choice of fuel. This is largely a matter of location. In a general way the proper fuel to use is that which will evaporate the greatest quantity of water per dollar's worth of fuel. It does not pay to burn too poor a quality of fuel, however, because slack containing a great quanity of ash and sulphur will cake and clinker on the grate bars, make a great deal of work for the firemen, refuse to be forced when necessary, and make much ash to be removed. On the other hand it will not do to make all arrangements for using a very expensive fuel, as a very little wasted in times when the furnaces must be rushed will make a great difference in the cost of operation. As an expensive fuel usually means one which is brought from a great distance, any furnace prepared for burning this would operate under unfavorable conditions if the supply is cut short by strikes or railroad blockades. Where the conditions are favorable for the use of oil, it makes an ideal fuel, requiring no handling, making no smoke or ashes, and allowing the fire to be regulated with the utmost nicety. Buckwheat anthracite coal is used largely by power-houses in the Eastern cities. It is of high calorific value, clean, making no smoke and little ash, and capable of being readily handled in coal conveyors and mechanical strokers. In the Western cities soft bituminous coal is used by force of necessity. This brings with it the troubles of ash, clinker and dirt, and in the city renders necessary some form of smoke consumer. As has been stated, it usually happens that the choice of fuel is a matter of location, but in cities where several competing grades of coal come to market, it would probably pay to have expert tests made to determine what grade of coal or what mixture is most economical for the work.

In the East, the use of mechanical stokers has grown to such an extent that no large power-house is considered complete without them. In most of the Western cities, however, and especially here in St. Louis, the mechanical stoker has not been a success. This difference in results may be attributed to the difference in the fuels used. The buckwheat coal of Brooklyn and Philadelphia feeds evenly on the stoker and causes no trouble by cementing the grate bars together by clinkers. With the soft, fragile, bituminous coal, however, clinkers soon form on the grate bars, and very often the fire must be almost completely destroyed to remove them. No mechanical stoker will bear crowding to any great extent and any power-house using them must be supplied with a greater capacity of boilers than one where hand firing is the practice. By reason of the fact that the coal is introduced gradually into the hottest part of the fire and the volatile matter slowly driven off, the mechanical stoker is a partial smoke consumer. With the exception of this, there is no advantage in the use of mechanical stokers, except the labor saved, as the great efficiency which was formerly claimed for them has never been proved in actual practice.

Notwithstanding the great number of types of boilers on the market, they may be divided into two general classes, fire tube and water tube. In most of the more recent power-houses, some form of water-tube boiler has been adopted, as this type possesses some marked advantages over the fire-tube boilers. They are non-explosive, they may be operated at a higher pressure and consequently are more suitable for use with compound engines; they have a large heating surface and are quick to respond to calls for power; they occupy less floor space and are usually more intelligently designed than the other class. On the other hand, their first cost is greater; there is a greater number of joints to be looked after, and the cleaning is more difficult, especially in those forms which use a curved tube. It has usually been considered that the efficiency of water-tube boilers was much higher than the fire tube, but now there is a form of fire-tube boiler being made consisting of a shell of large diameter and extra length, containing a large number of flues, which approaches the water-tube boilers very closely in efficiency. The high efficiencies obtained in boiler tests are seldom reached in actual practice as they usually result not so much from excellence of design in the boiler itself as from careful and intelligent firing during the test.

It is hardly necessary in presenting a paper before this intelligent body to discuss the reasons why water should be fed into the boilers as hot as possible. Besides preventing the straining of the boiler shell from the sudden changes in temperature, there is a large quantity of fuel saved, and the percentage of this saving will be found tabulated in nearly every work on thermodynamics. The usual methods employed in heating the feed water are, first by the heat of the exhaust steam, and second by the heat of the escaping flue gases. There are numerous patented devices for utilizing the heat of exhaust steam, either by passing the exhaust through a number of pipes surrounded by the feed water, or by spraying the feed water across an opening through which the exhaust steam is admitted. Most of these devices are very simple in their construction, and their efficiency depends verly largely on the length of time the feed water and the exhaust steam are in contact, and in case they are in separate chambers upon the conductivity of the separating medium. Care should be taken that the opening for the exhaust steam is never contracted, so that any possible back pressure on the engine is avoided.

The method of heating feed water by the heat of the escaping flue gases has been applied in apparatus under the general name of economizers. The arrangement usually employed is a coil of pipe containing the feed water placed in the flue. In order to keep the soot from settling on the pipes, most forms of economizers are supplied with a mechanism for scraping off the pipes whenever necessary. Sometimes the economizer consists of one large bank of pipes placed in the main flue, and sometimes the apparatus is divided into a number of banks, each placed in a flue leading to one furnace. The choice of arrangements depends largely upon the size of the plant and the general location of the boilers. By means of a properly designed economizer, feed water may be heated to a very high temperature, even above the atmospheric boiling point of water. In the use of any device in which feed water is heated by the flue gases, care should be taken that the escaping gases will still retain sufficient heat for the maintenence of the necessary draft after part of their heat is taken from them by the feed water. In the case of, power-houses using natural draft, economizers should not be used, where the draft is not already sufficiently strong, or is just barely strong enough for the work to be done. There are in operation, however, many plants using natural draft, discharging flue gases at a very high temperature, much higher than is necessary to maintain the required draft. Economizers used in such cases would result in a marked gain in economy.

Whatever system of heating feed water is used, the apparatus should be made abundantly large for the work to be done; first, that the water should pass through slowly and receive the full benefit of its contact with heated gas or steam, second, that a large store of water may be kept on hand which is of great service in case of a sudden demand on the boilers; and third, that the feed-water heating apparatus may act as a water purifier. It has been found that water kept for some time at a high temperature will deposit a great portion of the carbonates and sulphates of lime and magnesia which it has in solution. This is probably due to the expulsion by the heat of the carbonic acid gas contained in the water, thus freeing from solution the lime and magnesia which it is well known are slightly soluble in water containing carbonic acid gas.

With condensing plants, the waste from the condensers is never at a greater temperature than 100 deg. Fahr. and if hot feed water is desired the use of an economizer becomes almost a matter of necessity, as the water from the pumps and the other non-condensing machinery would not have sufficient effect in heating the feed water of a large plant.

Several of the large power-houses built during the last few years have abandoned the use of stacks for producing draft, and are operating by means of an induced draft produced by fans placed in the flue or short stack. In this case, the stack is just high enough clear the roof. This system has many advantages. First, there are no stacks to blow down or fall down, and this point is of special importance in a region subject to tornadoes. The second and most important advantage, however, is the absolute control which it affords in governing the fires, and this point will appeal especially to those power-houses subject to sudden and rapidly changing loads. As an illustration of this may be cited the power-house recently erected to operate the Baltimore Tunnel road. A great part of the time there is no load on the power-house, as it is only operated when there is a freight train to be hauled through the tunnel. The manner in which the load is handled is as follews: The boiler-room is supplied with blowers in place of stacks, and a slow fire is kept constantly under each boiler. When a telegram is received that a freight train is approaching the blower is started, and on the arrival of the train steam has been raised in sufficient quantity to supply the great demand put upon the boilers. This illustrated the extreme flexibility of the system and it would be difficult to handle this load in any other manner. Economizers are operated with great efficiency in connection with an induced draft, as this system permits the flue gases to be robbed almost entirely of their heat, since it is not necessary to have a large quantity of heat in the flue gases in order to create a proper draft.

Passing from the steam-generating system to the engines, we find as a connecting link, the system of piping. In regard to the general plan of the piping, opinion is very much divided. Some favor a single header with leaders to the engines. Others claim that a complete duplicate system is necessary; so that a failure in any part of the system need not cause a serious stoppage. The objection to a duplicate system is the greatly increased cost. In the installation of a duplicate system, it is only human that the material and workmanship employed will be cheaper than if a single system were employed, because it is reasoned that if one side breaks down, there is always the other to be depended upon. The other side, however, is often never used until a case of necessity arises, and on account of this very lack of use, the valves and joints are apt to be found leaky and in bad condition when suddenly put in operation. A compromise system has been used in some cases in which all pipes are duplicated, each side, however, having only one half the capacity required, necessitating the use of both sides at all times. In case of an accident to one side, the other half of the system may be used by increasing the steam pressure. The best plan, however, seems to be to use a single header divided at convenient intervals by valves according to the size of the plant and the number of units employed, and in laying out the system to use only the best valves, material and workmanship. The power-houses having the least amount of trouble with their piping are those having a simple system, probably because it is natural to erect better, and take better care of something which is in constant use, than something which may easily be dispensed with. All steam and hot water pipes should be covered so as to prevent as much as possible loss of heat by radiation and consequent condensation of the steam. And in this connection it should be noted that there is a great difference in efficiency in the different kinds of pipe covering. Tests have shown that the magnesia plastic and sectional coverings and the asbestos fire felt covering give the best results (*Journal of the Association of Engineering Societies*, January, 1895). A water separator should be placed in the leader to each engine. It should be large in size and placed as close as possible to the engine. A number of patented separators are on the market, but very good results may be obtained by the use of a simple large tank, with the steam entering at the side and leaving at the top, and supplied at the bottom with a connection to a steam trap to catch any water collecting in the separator.

Steam-Consuming Apparatus.—The question of the selection of the proper engine to operate the plant is so dependent upon what dynamo is to be used that it will be best to abandon our arbitrary classification temporarily and take up first the question of the dynamo. During the past four years the street railroad generator has undergone a radical change. In the spring of 1893 there were installed in this city, in the power-house of the Cass Avenue & Fair Grounds Railway Co., then being built, the first large direct driven generators of the type which has since become so common. Soon after this the Intramural Power-House at the World's Fair was put in operation, containing one generator of the same size as those in St. Louis and another of twice the capacity. Since that time there have been few large power-houses built in which direct driven generators have not been installed, and some of the large systems have found that economy of operation required a change from the belt, counter-shaft and unit of small size to the large direct-driven generator. At the present time, the West End Railway Co., of Boston, which may be considered the pioneer in this country in electric traction, is changing its central power station, which had originally been equipped with a very complete and elaborate system of belting and counter-shafting, to a direct-coupled plan.

The first cost of the direct-coupled generator is about 35 per cent. more than the belted generator of 500-K. W., which is the largest standard size in which the belted generator is made; but when the expense of the belt, belt-tightening device, and the floor space is taken into account, the direct-connected generator will be found the cheaper. Besides obviating the necessity of the costly and cumbersome belt, the direct-connected generator offers the following advantages: In large sizes and in connection with large engines it has a much higher efficiency than the belted unit; it requires a small floor space; it aids supervision by bringing the working parts of the engine and generator close together; it reduces danger; it is almost noiseless in operation, and it may be installed in a larger unit than the belt-driven generator, which is limited in size by the width of the belt and pulley which may be employed. The main objection which was urged against the direct-connected generator, was the fact that the shocks resulting from overhead loads were thrown directly on the engine, and that there was none of the cushioning effect that a belt connection might supply. While this is undoubtedly true, the best argument which may be submitted against it is that none of the installations of direct-driven generators can trace any trouble to this source. The large, slow-speed, multipolar, direct-driven generator has become perhaps the most prominent feature of the modern power-house, and while there may be special services which would necessitate a belted arrangement, it is difficult to imagine a power-house thoroughly up to date without direct-driven generators.

By varying the number of poles and the number of armature conductors in the construction of a dynamo, the machine may be designed to run at almost any reasonable speed, the slower the speed, however, the greater being the cost of the dynamo. In the matter of speed it is necessary for the dynamo maker and the engine builder to effect some sort of a compromise, because it is not good practice to run such large engines at too high a speed. The speeds which are most common are 75 revolutions per minute for the 1,500-K. W. dynamo, 80 to 20 revolutions per minute for the 800-K. W. dynamo and speeds ranging from this to 150 revolutions per minute for the smaller sizes. These speeds are what would have been considered four years ago quite out of the range of the Corliss valve gear, but now there are many large Corliss engines driving generators at speeds up to 100 revolutions per minute, and some have even higher speeds. Several other types of engines have been adapted to this work and are running quite successfully. Outside of the question of valve gear, most engines made for this work possess the same characteristic; the heavy bed plate, the solidly-constructed fly-wheel—now being made of steel plate—the wide crosshead, the large connecting rod and the mammoth main bearings.

The choice between horizontal and upright engines is chiefly one of space. The horizontal engine is the cheaper, the simpler, the easier to inspect and the easier to repair. Outside of the advantage of requiring less space, the upright engine has the advantage of less wear on the cylinder, and a more direct strain upon the foundations.

The usual practice in the most modern power-houses is to install compound engines. Most of these plants are so favorably situated that condensers may be operated in connection with the engines. This is undoubtedly good practice; but in case condensers are not used, the cost of fuel must be very high for the gain in compounding to pay for the extra investment. Where power houses are favorably situated on bodies of water, condensing becomes a very simple problem, but in case the power-house cannot be built on a body of water, as in this city, for instance, in order to use condensing engines, some sort of arrangement must be designed to cool a quantity of water so that it may be used over and over again for the purpose of condensing the exhaust steam. Devices of this kind have long been in use in the city of San Francisco and in Cuba, and lately several of the large manufacturing companies have put on the market complete apparatus for the purpose of cooling water after it has condensed the exhaust steam so that it may be used again for the same purpose. Besides the gain in power by using condensing engines, it is claimed that by the use of this apparatus actually less water is used than if the steam is exhausted directly into the atmosphere without condensing.

In the use of large, direct-connected units, a great deal of the economy gained depends upon the selection of the proper sizes of machines. The efficiency of a generator will be good when it is operated at more than 75 per cent. of its capacity, but the efficiency of an engine drops off very rapidly when it is running below its rated load. In order to achieve the best economy from the use of large direct-connected units, the sizes of the different generators should be so proportioned that it is always possible to operate one or more units at their rated capacity. The railroad generator as at present built will stand an over-load of 50 per cent. for several hours without trouble and at a maximum efficiency. This should be taken into account in the estimate of the dynamos required, but it should always be the aim to have at least one idle machine to throw on the line in case of failure of any of the othors. The actual size of the units depends upon the character of travel which the road possosses and the number of cars, and this must be determined for each road independently. In choosing machines, however, standard sizes should always be adopted, as this obviates any trouble in obtaining supplies and repair parts.

The railroad generator switch board has become standardized to the extent that it consists of a panel for each generator, each panel containing the usual automatic circuit breaker, ammeter, field rheostat, field switch and main switch. It is hardly necessary to mention that there should be nothing combustible about the board, and it is not an absolute necessity for the board to contain a marble tablet inscribed with the illustrious names of the President, Vice President and Secretary. It would confer equal fame and perhaps be more economical of valuable space for their names to be handed down to posterity in some manner less electric. Switch boards as now erected usually contain a recording watt-meter and an ammeter which shows the total output of the power-house. The recording watt-meter especially is a valuable instrument, as by means of its readings exact records of the power-house may be kept.

The modern method of line construction is to divide the trolley into sections and connect each section separately to the main buss bars through feeder panels, each of which contains an automatic circuit breaker, an ammeter and a switch. This method confers the advantanges that trouble on the line is always indicated on the proper section, and that in case of short circuits on the line, the main circuit breakers are protected by the section circuit breakers, and the load is not suddenly thrown off the engines by the opening of the main circuit breakers. Most of the generator and feeder boards are supplied with devices for preventing damage to the station machinery by lightning, but a very simple and effective arrangement is to connect a large water rheostat between the positive buss bar and a good ground. This is either left in circuit continuously with a small current running through it, or is out into cir cuit on the approach of a storm.

Besides those machines which are absolute necessities in a power-house, there are various devices which may

be added to secure convenience and regulation. An overhead crane is installed in the engine-room of most of the large modern power-houses and adds greatly to the speed with which heavy repairs may be executed. An oiling system of some sort by which the oil is either pumped or flows by gravity to the different bearings obviates the necessity of manual labor in oiling and insures a steady feed at each bearing. A recording steam gage is found very useful in checking up the firemen. An air-pressure system is beginning to be used in many of the power-houses by means of which the carbon dust may be blown out of the armature windings. With this apparatus an armature may be kept thoroughly clean, and the danger lessened of short circuits occurring on account of the collection of carbon dust between its conductors.

If readings be taken of the total output of the power-house at stated intervals and then plotted, it will show a very small load through the night from half past one to half past five, a sudden rise at this point to a maximum about 7 a. m., a lower load through the middle of the day, followed by another peak between six and seven at night, after which the load again suddenly drops. In order to accommodate the machinery to the varying load, the number of dynamos in circuit must constantly be changed, and even then it is almost impossible to suit the power at all times to the load, the dynamos running much of the time either overloaded or underloaded, which, of course, means a sacrifice of economy. In addition to the variation of load shown by the curve, there is a momentary fluctuation, due to the starting and stopping of cars, the violence of which decreases with the number of cars in service. It is proposed to remedy this variation and operate the dynamos under a steady load by means of a storage-battery plant connected in parallel with the line, charged from the dynamos during the period of light load, and discharged into the line on the heavy call for power. The operation of the plant under these conditions is indicated in Fig. 1. Installations of this sort have been placed in several of the large electric-light plants, where they are operating with marked success, and there is no reason why they should not meet with the same degree of success in electric-railway plants. By means of this auxiliary plant the proper number of dynamos are run throughout the entire day at their full capacity and hence at their highest efficiency, the battery taking care of all eccentricities in the load, charging when the load is less than the capacity of the dynamos, and discharging when the load exceeds this. The steam plant may be shut down entirely during part of the night, leaving the battery to operate the road, and in case of a breakdown, the battery may be used to take care of the entire load for a short time. The battery is discharged through a booster dynamo, which is so designed that the compounding of the dynamos and the battery are the same. This arrangement is entirely automatic, so that no hand regulation is required. The efficiency of a battery operating under conditions of this kind will be guaranteed by the manufacturers to be greater than 75 per cent. and a maintenance of 6 per cent. per year on the first cost of the battery will be guaranteed. The great drawback to this system of operation is the large first cost of the battery which is about $100 per horse-power capacity, figured on a two-hour discharge rate. A storage-battery plant may also be used to increase the capacity of an existing power-house and thus save the necessity of adding more machinery. There is another use to which a storage-battery plant may be put, which will, perhaps, appeal more strongly to the street-railroad man. This is to install it as a substation to maintain the voltage at the ends of longfeeders, which are subject to fluctuating loads. In this case the batteries are charged from the distant power-house and discharged into the trolley wire. The feeders from the power-house to the storage batteries are figured only for the average load instead of the maximum load, as would be necessary in case the line is fed directly from the power-house. The economy in this installation depends very largely upon the difference in cost between the feeders in the two cases. Besides the question of economy, however, the substation will give the better service, as the voltage will not fall and rise with the fluctuations of the load. A number of power-houses operating long lines are now equipped either with boosters or high-voltage dynamos. Long lines usually have a booster constantly in circuit. This machine is automatic in its action and raises the voltage with every increase in the load. Some power-houses operate a high-voltage dynamo for use on sections which are subject to excessive loads. The feeder boards in this case are equipped with an extra buss bar so that any section may be thrown on the high-voltage machine.

While each individual engineer has his own ideas concerning power house construction and while each road building a power-house may purchase different apparatus, there is one general design which has been followed in many of the plants recently installed. It has been adopted by so many different engineers and in so many different places that it might almost be called the modern power-house. The engine-room and boiler-room are divided by a brick wall and under different roofs; both are brick buildings, covered with an iron truss roof; the boiler-room is set on the grade of the street and the engine-room 10 or 12 feet above this grade, the space below the engine-room being utilized for the piping and condensers; the engine and boilers are set at right angles to the wall between them, with the engines next to the boiler-room, so that the piping is made as short as possible and the condensation lessened. The switchboard and feederboard are set on the opposite side of the room from the boiler-room, so that the length of the dynamo cables is equalized as much as possible. The general features of this design may be summed up as follows: It is compact to save real estate and buildings and to minimize the number of employees and the superintendence. Large units are used for the sake of economy and to save the number of working parts. The building is, as far as possible, fireproof.

The electric part of the problem has been solved, temporarily at least, by the adoption of the multipolar, direct-coupled dynamo. The large, slow-speed engine has followed as a necessary consequence, and the general direction of improvement in power-house construction seems to be toward the use of devices to prevent the waste of heat and to minimize the labor required.

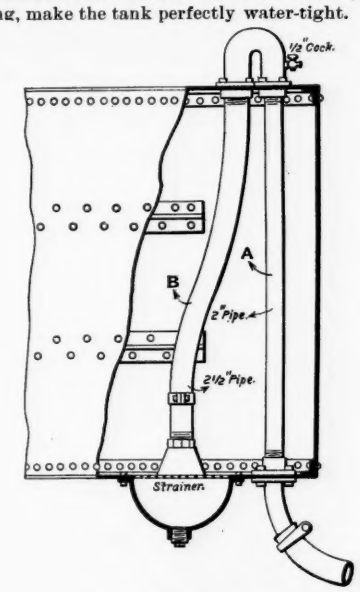
There can be no more appropriate place to quote the proverb that cleanliness is next to godliness. An engine and dynamo room should be kept scrupulously clean. This is especially true in regard to the electrical devices, as a very small amount of grease and dirt in the wrong place will cause serious damage. Beyond the mere æsthetic consideration that cleanliness improves the looks of things, there is also the fact that a thorough cleaning amounts to a rigid inspection, and small leaks and defects are often discovered in this way which might otherwise pass unnoticed until they had become serious matters. It is to be regretted that this advice is not more generally followed, as there is more lost through dirty and greasy electrical devices, badly set valves, leaky steam joints, poor firing and careless supervision than ever will be gained through the use of compound-condensing engines.

As a means of comparing different kinds of machinery, figures as to cost of operation have been collected from some of the large modern power-houses, and their comparison reinforces what has just been stated, that less depends upon the refinements of the machinery than upon the condition in which the apparatus is kept and upon the supervision to which it is subjected. Among those having the lowest cost of operation was a power-house, equipped with direct-coupled generators, but operating single-cylinder, non-condensing engines, burning soft coal and using hand firing, while among those having the highest cost of operation are several power-houses supplied with compound-condensing engines, and burning anthracite coal. The lowest results are about three-quarters of a cent per K. W. hour, some records running slightly below this, while the results from some of the large stations are as high as one and a quarter cent per K. W. hour. These figures include the cost of coal, water, supplies, repairs and all labor, but do not include anything for taxes, insurance, interest or depreciation. The cost of operation depends largely upon the cost of coal and upon the relation of ths average load to the total capacity of the power-house, the higher this ratio, the less being the cost of operation.

The modern electric-railroad power-house, although it has been developed entirely within the past ten years, represents the thought and the experience of many men. It has been developed carefully, detail by detail, until it is now a work both of reliability and efficiency. No one man and no one company can claim the credit for this achievement, but no class of men hold a stronger claim to recognition than the managers and owners of street-railroad properties, who have ever been ready to encourage with their patronage each improvement who have freely distributed the information gained by their experience, and who even in the most radical departures have ever acted with the courage of their convictions.

Linstrom's Non-Freezing Suction Pipe for Locomotive Tender Tanks.

The principle of this apparatus will be readily understood and appreciated by those who are familar with the use of tank valves and the numerous repairs and accidents incident to their use. With his device, the patentee, Mr. Chas. Linstrom, Master Mechanic of the Yazoo & Missippi Valley Railroad, at Vicksburg, Miss., claims to eliminate the employment of valves, rods and other appurtenances now in use on locomotive tanks, and by so doing, make the tank perfectly water-tight.



Non-Freezing Suction Pipe.

It will be seen from the illustration that the apparatus is in the form of an inverted U-shaped pipe having two vertically disposed members *A* and *B*, connected with each other at their upper ends by a return, which passes through and above the top of the tank. The lower end of the member *A* is provided with an elbow, to which is clamped the hose, which is connected in the usual way to the locomotive feed pipe. The lower end of the member *B* is provided with a funnel-shaped strainer, extending into a well which is provided with a washout plug. In the return connection is arranged a lubricating and air cock, to permit the admission of air into the suction pipe so as to prevent syphoning the water out of the tank when the hose is disconnected from the locomotive feed pipe; this cock is also adapted to be used for lubricating the nozzle of the injector while the latter is in service.

It will be seen that by the arrangement described the water in the tank is withdrawn therefrom for use by setting the injector in motion, it being understood that the water, in passing through the suction pipe, is drawn out of the tank until completely empty by the aid of a vacuum formed by any suitably constructed lifting injector.

It will also be seen that the water in the feed pipe and hose can be forced back into the tank by the use of the injector in the other direction, leaving no chance for freezing up the connections, hose, etc. The device itself is protected from freezing by being inside of the tank. These facts will be appreciated in a cold climate.

The Iron Gates of the Danube.

A general description of the iron gates and of the cataracts and obstructions in the Lower Danube, and something of the history of the removal of the obstructions, were given in the *Railroad Gazette* last week. A short general account of the work done may be of interest.

The contract for the great work of regulating the Lower Danube was given May 22, 1890, to a syndicate composed of Julius Hajdu, a Hungarian engineer; Hugo Luther, a manufacturer at Braunschweig, and the Berlin Discount Society. This syndicate took charge of the works at once, and began operations at the Iron Gates and at the point of Greben, further up the river, on Sept. 18 of the same year. The contract was general, comprising the entire work of opening up the Danube to navigation, and included the work at the Iron Gates. A memorial tablet commemorating the beginning of the enterprise was cut in the cliff on the Hungarian shore, over the rock Alibeg, with the following inscription:

> "These works, sanctioned by the XXVI. law of 1888, and destined to remove the navigation hindrances at the Iron Gate and other cataracts, were begun in the reign of the Hungarian King, Francis Joseph I., in the time of the Prime Minister, Count Julius Szapàry, by the Minister of Commerce, Gabriel Baross de Bellus, on the 15th September, 1890.—God bless this work and its creators."

The contract at the Iron Gates provided for a canal 80 meters wide at the bottom, to be at least two meters deep at low water, this canal to extend along the right, or Servian shore, of the river, from a point just above the small village of Sibb, a distance of 2,480 meters (1.54 miles), up the river, passing through the rock Prigrada.

The work was begun by building a dam above the proposed head of the canal, to divert the river and leave the bed on the right side dry. On the canal itself, the work consisted in excavating a channel and in building training walls, these latter being built on both sides of the channel to confine the water and thus raise its level at the time of low water. These two departments of work were carried on simultaneously, the rock which was blasted out to form the channel being used in building the walls. The excavating was done by the ordinary drilling and blasting methods, the broken rock being carried off on trucks drawn by small locomotives to the training walls. The rock taken out consists of a hard arenaceous limestone, interstratified with beds of slate, and was found to answer very well for use in the walls. The excavation was carried on at times very rapidly, there being weeks, and even months, when the amount of rock taken out averaged 1,000 cu. meters per day.

After the greater part of this channel had been blasted to the depth of two meters, as specified in the original contract, it was decided to increase its depth to four meters (13.12 ft.), below low water, so as to allow small war vessels to go up the river as far as Orsova. Powers to carry out this change were obtained in the latter part of 1891, and the work of deepening was begun immediately. The excavation of the channel was completed in March, 1894, but it was only recently that the walls and the fill ing were finished, and there still remains considerable sub-aqueous blasting and excavation to be done at and outside of each end of the canal. As nearly as can be learned the removal of rock on shore or in shallow water has amounted to 227,000 cubic meters, and that in the open river, 27,840 cubic meters.

The training walls on both sides of the channel are built of stone, the material being largely provided, as mentioned above, by the rock blasted out from the canal bed. This, however, was not sufficient for all needs, and it was found necessary to open a quarry about a mile up the river above the canal. Both walls are carried to five meters above the highest known water mark, thus providing against all possibility of overflowing. The crown breadth of the right, or southern, wall is 6 ft., it having been so built that it may be used as a tow-path. The left wall is four meters wide at the top. Both dykes have a slope of one in one and three-quarters on the inside, *i. e.*, toward the canal, and one in two on the outside. The revetments are flat, for the better protection against ice. Both dykes are built up of broken stone, being filled in with a mixture of earth and gravel, and are paved throughout on the sides. Some idea of the size and extent of this wall building may be gained from the fact that the dyke building necessitated about 294,000 cubic meters of broken stone, and 270,000 cubic meters of filling material; 68,400 cubic meters of stone revetment were laid.

The canal is 80 meters wide at the bottom, and bells out at the upper end to a width of 400 meters, thus always insuring a sufficient flow of water. The canal is curved, with the curvature toward the shore: for a length of 1,180 meters from the bell the radius of curvature is 1,170 meters, the remainder of the water-way being straight. The upper mouth leads into an open cut, not yet completed, extending to Alt Orsova, on the frontier of Hungary and Roumania, where the railroad from Bukarest leaves the Danube and turns off to the north. The distance from Orsova to the mouth of the canal is five miles, two miles being so shallow that cutting is found necessary.

These open cuts, or rather channels under water, are made by drilling, and subsequent blasting and removal of the broken rock, when the depth is greater than 20 in. For a less depth, and in case of a very uneven bottom, the rock crushers, first used in the Suez Canal, have been found to do best service.

The drilling of bore-holes and the blasting operations in the former case are conducted from specially constructed barges or floats. In this line of work, two systems are being employed, that of the Ingersoll-Sergeant Drill Company, of New York City, and the Fontane

system. The explosives used are dynamite, with 75 per cent. of nitro-glycerine, and explosive gelatine, with 93 per cent. of nitro-glycerine, which last has been found much the more effective and satisfactory.

The rock crushers, as used by Messrs. Lobnitz, in 1888, on the Suez Canal, have been found very effective in this work of open cutting, when the depth is small. In this method the rock is shattered by the blows of a heavy bar which is allowed to fall freely from a height on to the face of the rock. These bars, or chisels, have a maximum length of 29 ft., a cross-section of from 14 to 20 in. square in the center, and weigh from 8.5 to 10 tons. The cutting edge is of steel, with an angle of 90 deg. There are now three boats fitted with these crushers in use on the Lower Danube.

On Feb. 29, 1896, the dam was removed, and water admtted to the canal. Above the barrage, across the mouth of the canal, had been built an auxiliary dam, of clay, timber and rails. After the barrage was removed, this dam was broken down, thus letting the water in.

The original plans included a lock for the canal, and one may still be built, although, on account of the radical change made in the plans by increasing the depth by two meters, a lock will probably not be found either necessary or economical.

It is now expected that the open cuts outside of the canal itself will be completed in about a year and a half, at the end of which time, as far as the Iron Gates are concerned, the Lower Danube will be ready for navigation. Considerable work, however, yet remains to be done at other points in the river, and it may be longer before the whole is completed. When the work is finished, vessels of four meters draft will be able to reach Orsova from the Black Sea, without hindrance, and vessels of three meters will reach Vienna.

Car Lighting by Power from the Axle.

The cuts illustrate the system of car lighting of Mr. Morris Moskowitz, in which the electrical energy from which the light is derived is taken from a revolving car axle. The system is controlled by the National Electric Car Lighting Co., of New York, and has been tried on several railroads, at the same time being gradually improved.

The main parts of the apparatus are the dynamo and its driving gear, a storage battery divided into two sets, a switchboard and a lamp circuit in the car. The system is automatic and needs only an occasional inspection at the terminals.

The dynamo *E* (see Fig. 1) is fastened to the rear end of the car truck *F*, where it can be easily inspected. The transmission of power from the car axle to the dynamo is effected through a spring-cushioned counter shaft *G*, which is fastened to the truck bolster. On the car axle there is clamped a split, wood pulley *D*. From this pulley the belt *H* drives the pulley *C* on the counter-shaft *G*. The other pulley *B* on the counter-shaft drives the belt *H*, which is directly connected with pulley *A* on the dynamo *E*. Both these belts are of double thickness. Another view of the spring-cushioned counter-shaft *G* is given in Fig. 2. The shaft is provided with a pair of helical springs in such a manner that the shaft and pulleys are able to give and take, and in this way cushion the vibrations of the car axle. The bearings of the counter-shaft are interchangeable and need be looked after only about once a week. The lubricant used is a heavy grease. The dynamo bearings are provided with oil wells and self-oiling rings, and the dynamo itself is entirely encased in a steel cylinder, which protects it from dust and water. The brushes are made of carbon, and are so adjusted that they collect in both directions of the armature's rotation.

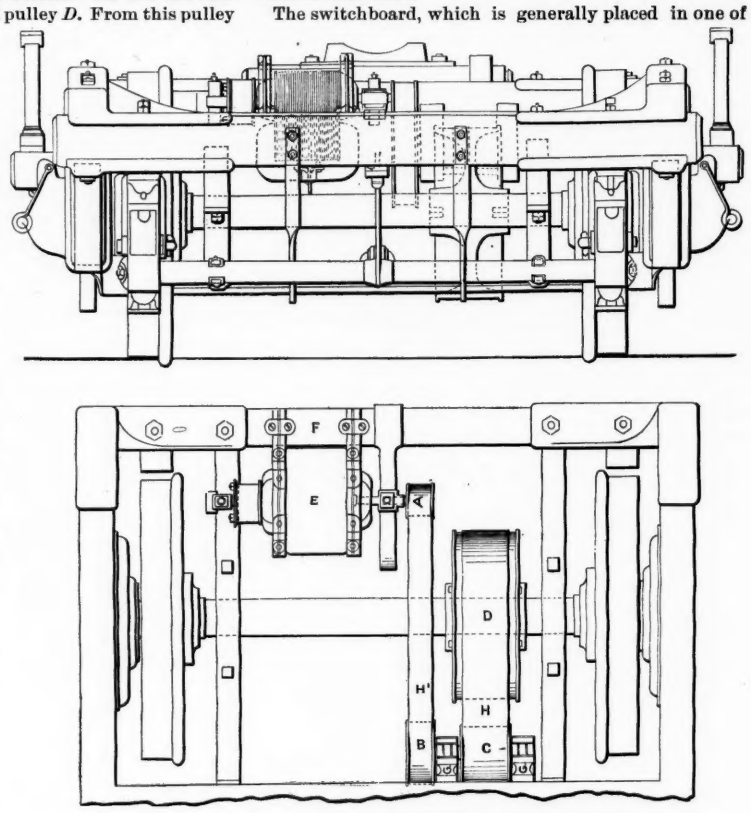


Fig. 1.—The Moskowitz Car Lighting Apparatus.

The dynamo is self-regulating under variable speeds. When the train has attained a speed of eight miles an hour the dynamo begins to generate its normal pressure of 45 volts. Should the train run at 60 miles an hour, the dynamo would be very little higher in electro-motive force, such is the regulation for a wide range of armature rotation. This is accomplished by field in a proportion which causes an electric equilibrium as far as the resulting product in electro-motive force is concerned.

The switchboard, which is generally placed in one of the closets of the car, has a number of ingenious features. As the system is entirely automatic the controlling devices are all combined on the switchboard (see Fig. 3). *A* is the main switch which controls every circuit pertaining to the dynamo. If, for any reason, the dynamo is desired not to generate, all that is necessary to do is to open this switch. *A* 1 is the switch of the main light circuit. *B* is an ammeter showing the quantity of current generated at any time, and *B* 1 is a small resistance coil for the light circuit which can be used if desired, but is not necessary. *C* is a special 12-point switch, which will be referred to later. *E*, *F*, *G*, *H* and *I* are electro-magnetic devices, which control the dynamo and automatically change the electric poles in accordance with the direction in which the train travels. The arrangement is simple and ingenious, and greatly contributes to the success of the system. Without this device, if the car is run in a given direction, the dynamo would generate current in one sense, and if it travel in the opposite direction the current would be generated in the opposite, which must not take place if a storage battery is to be charged. Provision is also made for automatically opening and closing the main circuit between the dynamo and the storage battery, by taking advantage of the difference of pressure existing at times in either of them.

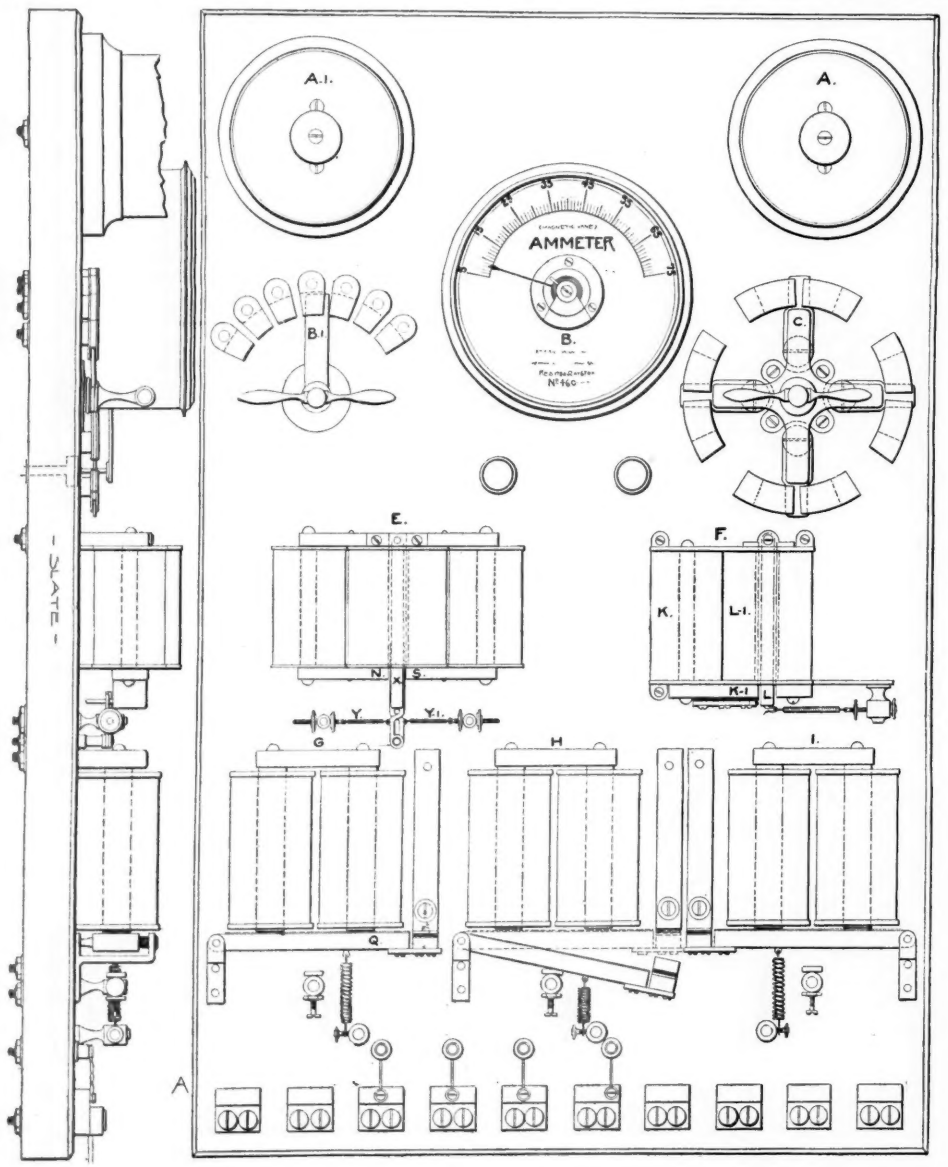


Fig. 3.—Electrical Car Lighting Apparatus.

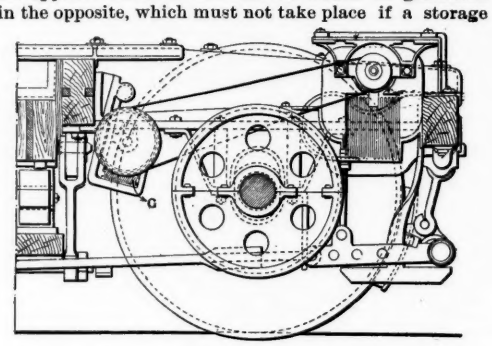


Fig. 2.—Car Lighting Apparatus.

The 12-point switch *C* is used to control the whole system as follows: In this system of train lighting, as stated before, two sets of storage batteries are used. One set is always connected to the dynamo-charging circuit, while the other is feeding the lamp circuit. When the battery on the lamp circuit is exhausted, the 12-point switch is turned, thereby switching the charged set on the lamp circuit and the exhausted set on the dynamo circuit to become charged again. It is impossible to change one and forget the other, as these operations all take place with one turn of the switch.

The storage batteries used in this system are made on a new design, by the company, for the sole purpose of electric train lighting. The standard equipment for a 60-ft. passenger coach consists of 12 sixteen candle-power incandescent lamps in the car and one in each vestibule, making 14 lamps all told.

Street-Railroad Parlor-Car Service in Brooklyn.

The Flushing Extension of the Brooklyn Heights electric road was formally opened between Corona and

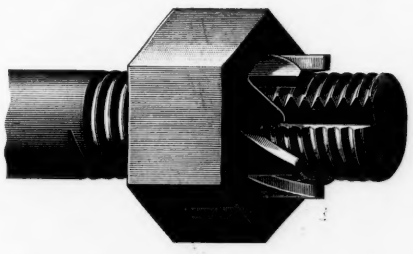
Flushing, L. I., Saturday, Oct 24, as stated among our construction matter this week. The handsome parlor car Columbia, containing the officers and directors of the road and a few invited guests, left the City Hall, Brooklyn, at 12:30 p. m., reaching Flushing, 10½ miles distant, in little over an hour. Here the party met and escorted back to Brooklyn the parlor cars Amphion and Montauk, containing officials of the latter town and their families, and five of the new 35-ft. cars referred to in our issue of Sept. 25. Luncheon was served on the parlor cars en route.

The opening of this extension will undoubtedly prove of much benefit to the town of Flushing. Heretofore, people wishing to go between that place and the shopping districts of Brooklyn had to go via Long Island City, the quickest way being by the Long Island Railroad, necessitating a change of cars at the last-named place and at East New York. The fare between Brooklyn and Flushing will be 10 cents and cars will be run every 20 minutes, starting from the even hour.

In connection with this line to Flushing a through express parlor-car service has been established, which is especially novel from the fact that we believe this company is the first to run parlor cars for regular street railroad service. Two of the cars will be run on Tuesdays and Fridays of each week, leaving Flushing at 9:30 a. m. and 2 p. m. respectively, making the trip to City Hall, Brooklyn, in one hour and five minutes. Returning, the cars leave City Hall at 12:25 and 4:55 p. m. A single trip costs 20 cents and a round trip 35 cents, the former being 10 cents and the latter 15 cents more than the regular fare. No passengers will be taken on after leaving Flushing or after leaving the shopping districts on the return trip. The idea involved in establishing this parlor-car service was mainly for the comfort and accommodation of ladies on their shopping expeditions.

A New Nut Lock.

We illustrate herewith what is, in reality, a locking nut, the use of a nut lock being dispensed with. Th principle involved is clearly shown in the cut. The nut, of malleable iron, is made with a series of teeth resembling the teeth of a saw. After the nut is tightened, the tooth opposite is bent to engage with the milled groove of the bolt. This groove is cut on one side (the under side looking at the illustration) at a right angle to the cylindrical surface of the bolt to a depth of about $\frac{5}{32}$ in., the other side being beveled. This allows the nut to be tightened by forcing the bent tooth out of the groove through a turn of the nut, but prevents the nut turning in the opposite direction, it being necessary in removing the nut to bend the tooth back to its original position.



The nut has been applied to track bolts on the Springfield Division of the Illinois Central Railroad between Gilman and Springfield, Ill., and on the suburban line between Chicago and South Chicago, and on the Chicago, Milwaukee & St. Paul in Chicago.

The nut lock is the invention of Mr. Crawford Elliott, and is made by the Elliott & Hatch Nut Lock Co., 514 Postal Telegraph Building, New York City.

Legislation of the Past Year.

Accounts of new laws affecting railroads which have been lately passed in the several states have appeared from time to time in the *Railroad Gazette*.* We are now able to give a few items which have not before been mentioned, by the appearance of the annual address, before the American Bar Association, of the President of that body, Mr. Moorfield Storey. This address was delivered at Saratoga, N. Y., Aug. 18, but the full text has only just appeared in print. Mr. Storey surveys the whole field of legislation, in Congress and throughout the Union, and we may say in passing that everybody, both lawyers and laymen, will find his paper exceedingly interesting throughout. We make reference here to only those parts particularly affecting railroads. We may note, however, that the decision of the United States Supreme Court in the Brown case (161 U. S., 591), compelling a witness to testify even when the evidence might criminate himself, has been quickly taken advantage of in two states, Ohio and Utah, to strengthen the laws designed to prevent bribery and other corrupt practices in elections. These states have passed election laws with clauses similar to the "Pardoning Act" passed by Congress Feb. 11, 1893.

Laws making stringent regulations concerning the safety and health of persons in factories and the use of machinery have been passed in Maryland, Utah and Massachusetts. In Utah blacklisting is a felony. The term "fellow-servant" is elaborately described by a law passed in that state. Mississippi has done likewise, defining railroad employments with considerable particularity. The latter state has passed a law to facilitate the construction of sidetracks for factories. The anti-trust law of the same state imposes a penalty on a railroad or telegraph company refusing, for the purpose of favoring a trust, to transmit messages or carry freight. The penal provisions of this law are so sweeping that Mr. Storey suggests that many lawyers and other highly respectable gentlemen had better keep out of Mississippi.

Kentucky requires every railroad more than five miles long to run at least one passenger train each way every day except Sunday. Mississippi permits the omission of the crossing stop if approved interlocking is used. The New Jersey street-railroad law forbids street railroads to carry freight or express matter unless they were engaged in such business before the law was passed, while Massachusetts in several cases authorizes such lines to carry freight. Maryland exempts from the steam-heating law all passenger trains used in carrying passengers to the inauguration of the President at Washington. The obvious purpose of this law is to permit the use, on the occasion named, of summer cars, which it would not be worth while to equip with heating pipes; and as March is not a very cold month in Maryland, probably this is all right; but Mr. Storey seems very much puzzled to account for the law, and wonders why the people thus riding, who, presumably, are innocent, should be treated as outlaws and left at the mercy of the car stove.

Iowa provides that no corporation whose stock is controlled by non-resident aliens shall hold real estate within its bounds. Laws regulating the use of bicycles in the public streets (treated in this address under the head of Amusements) have been passed in New Jersey, Maryland and Virginia. Kentucky has passed a law to provide for the reorganization of railroad and bridge companies. This Mr. Storey regards as of special importance, being the first attempt to deal with this subject by legislation. This act is made the text of the principal part of his address, and this part we give nearly in full under another head.

*In Iowa, April 24, 1896, page 287; New Jersey, pages 247, 368; New York, 389, 436; Ohio, 410, 456; South Carolina, 248; Virginia, 236.

Annual Convention of the American Street Railway Association.

The fifteenth annual meeting of the American Street Railway Association was held in the Auditorium Building, St. Louis, Oct. 20-23. To say that the convention was a success in every particular does not do justice to the able manner with which it was conducted and to the great interest displayed. Over 40,000 sq. ft. of floor space in the large auditorium was occupied by the 125 or more exhibitors, which is about 50 more than exhibited at the Montreal convention last year. Together with the names of the exhibitors mentioned below, there were those represented by other companies and whose names appear only in connection with the exhibits of other firms. The main floor of the building was taken up for the most part by the General Electric, Westinghouse, Walker, Brill and Peckham companies. The exhibits showing the improvements which have been made in electrical apparatus during the past few years, and particularly those new devices which have appeared since the last convention, was one of the interesting features of the convention.

The papers presented at the meeting were of unusual interest and exhaustive in their treatment. All were well prepared and so treated as to be of practical value to street railroad men. These papers, together with discussions which followed their presentation, will be printed either in full or in abstract in this and subsequent issues of the *Railroad Gazette*.

Although St. Louis has welcomed three or four conventions during the last few months, we do not believe any were better entertained than the American Street Railway Association.

The session was opened Tuesday morning at 11 o'clock, with President H. M. Littell in the chair, by an invocation of divine guidance by Rev. E. P. Roberts. The address of welcome was then delivered by Mr. Charles Nagel, acting Mayor of St. Louis. Among other things in his excellent address, Mr. Nagel said, "We cannot do more for you than we would do for others; because we have a way of always doing our best. You will have to be content to receive at our hands that hospitality which we have been in the habit of extending to all our guests wherever they come from or whatever may have been their purpose."

In his annual address, the President dwelt upon various points in relation to disputes between state and municipal governments and the street railroad companies. He stated that there was a growing tendency to increase the burden of taxation to a marked degree. "Of all corporations," said President Littell, "those which suffer most from this prejudice against corporations are those which exercise a public franchise, and the street-railroad franchise seems in particular to be a favorable object of restrictive legislation. The only remedy for the present state of affairs is to be found in that general and gradual enlightenment of the public by which it will be induced to keep the imposition of financial burdens within reasonable bounds." He stated that one of the severest strains to which street-railroad corporations are subjected consists in the penalties imposed by the courts for the negligence of their employees. Cases where formerly verdicts of $2,500 were rendered, now often result in a judgment of $5,000, and others in like proportion. While thus pointing out the unfavorable conditions in which the corporations are often placed, he also called attention to the fact that the railroad companies were not without fault in the matter of accidental injuries, and stated that the only remedy to be found is in the *discipline of the force*. If discipline is high and well maintained, accidents will be reduced to a minimum. At the conclusion of the President's address Mr. Baumhoff, of St. Louis, presented him, in behalf of the city of Chicago, with a handsome gavel.

The report of the Executive Committee was then presented and showed a membership in October, 1895, of 173 companies. Eight new companies had joined the association, three had become consolidated, one company had withdrawn and 13 companies had been dropped for non-payment of dues, leaving a present membership of 164 companies.

The first paper presented was by Mr. W. K. Bowen, Superintendent of the Chicago City Railway Co., on "Track and Track Joints, Construction, Maintenance and Bonding." There was considerable discussion on this paper, especially in regard to bonding rails and as to the advantages of cast-welded joints.

Wednesday morning, Mr. John N. Akarman, Superintendent of the Worcester Consolidated Street Railway Co., Worcester, Mass., presented a paper on "Trucks," which was read by Secretary Pennington. A paper on "The Modern Power-House," by Mr. Richard McCulloch, Civil and Electrical Engineer, Citizens', Cass Avenue & St. Louis Railroad, was then presented, which paper we have printed in full this week. In the discussion which followed Mr. B. J. Arnold, of Chicago, spoke upon the question of the use of storage batteries in power stations and stated that battery auxiliaries had been used successfully for regulating work in power stations where the load was variable. He further called their attention to the type of plates which should be used in the battery; that is, whether the plate is built for regulation or for slow discharge.

The Thursday morning session was adjourned until 12 o'clock so that the members might have an opportunity to examine the exhibits in the Auditorium. When they re-assembled, Mr. B. Willard, General Superintendent of the New Orleans City & Lake Railroad of New Orleans, read a paper on "Modern Overhead Electric Construction." After the presentation of the paper the Committee on Nominations for officers for the ensuing year made the following report:

For President, Robert McCulloch, Vice-President and General Manager of the Cass Avenue & Fair Grounds Railroad Co., St. Louis.

First Vice-President, C. S. Seargeant, General Manager West End Street Railway Co., Boston.

Second Vice-President, D. B. Dyer, President Augusta Railway Co., Augusta, Ga.

Third Vice-President, C. F. Holmes, General Manager of the Metropolitan Street Railway Co., Kansas City.

For Executive Committee, H. M. Littell, New York City; H. P. Bradford, Cincinnati, O.; Charles H. Smith, Troy, N. Y.; Harry Scullin, St. Louis, and George B. Hippee, Des Moines, Ia. For Secretary and Treasurer, Charles C. Pennington, Treasurer Chicago City Railway Co.

The report of the committee was accepted and the Secretary was instructed to cast the ballot of the Association for the gentlemen nominated. The Nominating Committee also reported that they believed the best place to hold the next meeting was Niagara Falls. The recommendation of the committee was adopted. A communication was then read from Mr. Ira A. McCormack, General Superintendent of the Brooklyn Heights Railway Co., asking that a committee of five be appointed to consider the propriety of the Association adopting a standard code of rules and regulations for the government of employees something similar to the practice of steam roads. On Friday morning the Chairman announced the following committee to consider the matter: W. F. Kelly, Columbus, O.; M. K. Bowen, Chicago; E. C. Foster, Lynn, Mass.; Ira A. McCormack, Brooklyn, and H. H. Vreeland, New York City.

Thursday evening about 300 persons, including about 50 ladies, attended the banquet at the Southern Hotel. The speeches were exceptionally good, abounding in humor.

At the closing session, held Friday morning, Mr. W. F. Kelly, General Manager of the Columbus Street Railway Co., Columbus, O., presented a paper on "Selection and Management of Employees," which was read by the Secretary. This paper was ordered published and furnished to the press at St. Louis, and will be read with interest by the employees of street railroads in all parts of the country. After the vote of thanks which was extended to the people of St. Louis, especially to the ladies on the Entertainment Committee, to the Local Committee, to the supply men for the magnificent exhibit they had given, and, finally, to the President, Vice-Presidents and members of the Executive Committee for the official discharge of their duties, the fifteenth annual meeting of the Association adjourned to meet at Niagara Falls.

EXHIBITS.

Adams & Westlake Co., Chicago.—The Acme car window shades and the Acme brake handle and arc lamps.

American Car Co., St. Louis.—A 25-ft. car mounted on a No. 2 motor truck.

American Car Sprinkler Co., Worcester, Mass.—Exhibit of a sprinkler in operation in front of the Auditorium.

American Railway Supply Co., New York.—Large variety of badges for employees.

American Steel Foundry Co., St. Louis.—Steel castings for street cars; bolsters, couplers, truck frames, Doddridge rail joint, and a combined spring seat and column guide.

(*Continued on page 759.*)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Western Freight Association has been reorganized and an agreement drawn up for two years and five months from Nov. 1, its terms being similar to those of the Southwestern and the Joint Traffic associations. We have no official information that the signatures of the companies have actually been affixed to the document, but the plan is understood to have been unanimously agreed to. There will be a Board of Administration consisting of five members, that is, four besides the present Chairman, Mr. Midgley. The names of the men selected are given in our Chicago letter in this issue. Questions before this Board must receive a four-fifths vote to be carried, and questions of apportionment of traffic must be decided by unanimous vote. Matters undecided by the Board may be referred to an Executive Board, which will consist of the presidents of all the roads. The presidents are to meet on the call of the Chairman or at the request of three or more membrs. A president may send a representative. Railroads (acting only through their respective boards of directors) may take independent action on six days' notice, the same to become effective 30 days afterward. There is a clause concerning forfeits, but no forfeit fund is provided for. The duties of the Board of Administration are defined in terms similar to those found in the Joint Traffic Association agreement. Notice of withdrawal must be given 90 days in advance. It will be seen that the principal difference between this plan and that of the Joint Traffic Association is in the limitation of the Board of Administration to five members. How the new scheme will work remains to be seen. As we have before remarked, we look upon the "continuous sessions" of the Board of Managers, and the presence in the board of a representative of every interest, as a peculiarly important element of strength in the Joint Traffic Association. The new Western association is to have the first of these features, but not the second. There are over 20 roads in the Western territory, and they cannot arrange a consolidation of interests so as to make up an administrative board of so few as 10 members, and this smallness of number is the saving feature which makes the Eastern managers' board possible. With a much larger number it would become unwieldly and possibly less cohesive. With no road represented in the Western board (the four members are, we suppose, to sever their relations with their present employers) the five men must be always resolute and impartial, which is very difficult when a hundred questions a week have to be dealt with. The board being thus constituted, its success will depend, even more than in the case of the New York board, on the personal character of the individual members. The position of the New York managers is not, by any means, ideal, however. As we pointed out when the association was formed, each individual must aim to be an impartial judge, while at the same time he is an advocate of his own road; he must be a partisan with a judicial mind—a rare combination. The Westerners will, we suppose, be free from the pressure of this demand for the accomplishment of the impossible.

Some Modern Locomotive Education.

The paper before the New York Railroad Club at the last meeting, by Prof. W. F. M. Goss, on the effect of forcing locomotive boilers, an extract from which was given in the *Railroad Gazette* of September 18, page 651, contains data that have an important bearing on locomotive economy. Professor Goss, at Purdue University, has with the corps of students at his command and the locomotive testing plant, a most excellent opportunity to gather knowledge about the working of locomotives and should have enthusiastic encouragement from all who are financially interested in the operation of steam railroads.

For years practical railroad men have speculated and experimented under the great difficulties of actual service, and evolved numerous pet theories about the best way to build locomotives. There have been small-port and large-port, straight-stack and diamond-stack, large-firebox and small-firebox controversies, based less on carefully observed facts and accurate data than on the personal equation. But what have the scientific minds done to elucidate these questions? A great deal, it is true, and yet comparatively little that is of real use in actual service, because of the lack of accurate data, the difficulty of collecting it, and the conflict of such data as was collected with the rigid opinions of the practical men having daily experience with locomotives. So the scientific mind has looked at the steam locomotive as a promising machine for analysis, but has been unable to accomplish anywhere near what one would expect in the way of precise and final results, largely because so many of those in charge of railroads were not scientifically interested in getting the best practical efficiency.

Marine and stationary engines and boilers have been carefully investigated and there are sufficient accurate records to enable a careful engineer to predict the efficiency of a new type with reasonable accuracy.

When compounding locomotives was taken up seriously several years ago there was promise of a new attitude toward the locomotive which would encourage students to examine more closely into the actual working in service with the feeling that their efforts in the direction of better economy would be likely to have practical effect. But bad designs of compound cylinders and complicated starting apparatus threw a cloud over the compound, and not until the beginning of shop tests of locomotives was a definite impression made on the minds of the average railroad man of the enormous yearly waste of fuel by inefficient locomotives that might be overcome by a little knowledge of the exact distribution of the losses as they occur in actual operation. It has been of the greatest value to the Chicago & Northwestern Railway, for instance, to have had for almost daily use its admirable testing plant. A number of common errors of design of details have been discovered and much of the locomotive equipment has been examined and its efficiency recorded. Important changes in locomotive practice have been made and the saving in fuel has actually been more than some railroad men are willing to admit.

Taking the practically useful results on a real railroad with a large equipment, and the widely published and valuable data obtained at Purdue University, there is a good chance now that the steam locomotive may get more scientific attention than it has ever had before, but this can only come with the removal of considerable prejudice from the minds of many of those who have direct charge of the motive power. We refer now to that class of men who know all about locomotives because they have been with them "ever since they were boys," and who have never cared to do hard reading. The railroad clubs are rapidly educating or forcing out this class, and the scientific work of a good many progressive motive power men, backed by two or three sensible general managers, is the lever that is doing the forcing.

Two Butting Collisions.

Two collisions recently reported, killing, altogether, 12 or more persons, illustrate once more the almost absolute futility of depending upon the conductor of a train to prevent disastrous consequences from the forgetfulness of the engineman. The rule placing the responsibility for the safety of a train on these two men jointly and severally is one of the most time-honored in the code, but, as experience has shown, in many cases it is one of the weakest.

A butting collision of passenger trains on the St. Louis & San Francisco, near Windsor Spring, Mo., 14 miles west of St. Louis, on Sunday morning last, resulted in the death of five passengers, one engineman, one fireman and three attendants in a restaurant in the baggage car of the westbound train, which was an excursion. The collision was a violent one and the first three cars of the excursion train were wrecked. The other train was light and carried but few passengers. The westbound was the second section of a regular train. Eastbound trains have the right to the road and the westbound engineman simply forgot this eastbound train. The conductor was collecting tickets and took no special notice of his whereabouts, though the eastbound train was on time and there were no unusual circumstances, except, perhaps, the extra load of passengers, to afford any shadow of excuse for not keeping in mind such a simple question of road-rights. In the absence of particulars concerning these men's mental processes at the time, the moral of this case, from the present light upon it, is the simple but forcible one—adopt the block system.

The other collision was one where the conductor *thought* promptly, but could not, or at least did not, *act* soon enough to avert disaster. It was on the Florida Central & Peninsular, near Swansea, S. C., on Oct. 14. Passenger train No. 35, south-bound, due at Swansea about 1:30 a. m., was over an hour and a half behind time, and north-bound train No. 36, due at Swansea at 3:05 a. m., was ordered to wait there until 3:15 for No. 35; but the engineman of the latter got it into his head that the order read "Sweeden," a station 20 miles further south, and he passed Swansea at full speed, meeting the other train about 1½ miles south of the station. Both engines were heavy ones, and the foremost cars of the trains were completely wrecked. Fire immediately started from an overturned stove in the mail-car of the south-bound train, and the mail agent, baggageman and one brakeman were burned to death. One, at least, of these men was conscious (before the flames reached him) and appealed for help.

In this case the conductor was on the watch and noticed the error as soon as the train passed the switch where it ought to have been stopped, but it appears that it took him some time to get the speed of the train even partially reduced. In testifying before the coroner's jury two days afterward the conductor said:

> When the train was passing the section-house at the north of the station at Swansea, I went out of sleeper into the first-class coach and found my flagman, Ulmer, sitting about the middle of the first-class coach. I touched him on the shoulder and told him that we would head in at Swansea; that is, take the siding for No. 36. He got up and walked forward into the second-class car, preparatory to jumping down the minute the train stopped and setting the switch. I followed him through the two coaches. I discovered that the engineeer did not stop at the first switch. I rushed out of the car on to the platform into the dark, so I could see where we were at. Just as we passed the water tank I discovered we were getting by Swansea. I pulled the bell cord in both coaches and rushed back into the sleeper, and put on the emergency brake in the sleeper, which slowed him down to 15 miles an hour from 50, and we were running at 15 miles when the collision occurred. Passengers sustain my statement. The collision occurred about a mile and a half or two miles from Swansea. A half-minute or more after the collision occurred a fire loomed up and set everything in the baggage car afire. We both read the order as Swansea in Columbia. I thought so at the time, and make the statement absolutely thinking it as such. The engineer read it Swansea. Had he not I think the opertor and I would have stopped him, as we were both looking at him.

The engineman testified that he did not hear any signal from the cars and did not feel the brake applied until he himself put it on.

There appears to have been no night operator at Swansea; but to have ordered the trains to meet at some other station would have delayed one of them considerably. This illustrates the difficulty of adopting the block system on roads where sidetracks and telegraph offices are few and far between. If, however, the block system is not to be adopted, how about provisions for safety under the old plan? The bell-rope appears to have been ineffective, and the day cars without conductor's brake-valves, for the conductor rushed back to the sleeping-car in a manner indicating that he had no confidence in his ability to stop the train otherwise. To be able to always stop a train on the shortest possible notice it is necessary not only to have a workable conductor's valve in every car, but to have trainmen trained to using it, in case of emergency, *before* wasting any time in trying to signal to the engineman.

The engineman's assertion that he put on the brake as soon as the conductor did, or before, may perhaps be explained when the railroad commissioners shall have investigated the case.

The moral of the terrible results of the fire enforces itself. This disaster is in no essential respect different from those like White River, Republic and others which, in 1887, led to a general revolution in car-heating appliances throughout the Northern states. And if the Sunny South needs artificial heat in October it needs continuous-heating apparatus.

The Clover-Leaf Injunction.

Receiver Peirce has secured from Judge Ricks, in the United States Court, at Cleveland, an injunction against the Lake Shore & Michigan Southern, the

New York, Chicago & St. Louis and the Michigan Central, as indicated in these columns last week. The roads named are forbidden to discriminate against the Toledo, St. Louis & Kansas City; and, in obedience to the injunction, they have abrogated their orders suspending through passenger traffic arrangements with the "Clover Leaf." Mr. Brown, the attorney for the Receiver, says that the Joint Traffic Association roads also threatened to sever freight relations. Interviews with Mr. Brown, published in Cleveland papers, state that the complaint presented by him to the court "attacks the Joint Traffic Association"; we do not understand, however, that this means that the association has been made a defendant, but rather that the action of the association is mentioned in support of the Receiver's arguments. The association is spoken of as "a combination to pool earnings" and as an unlawful conspiracy at common law. It is alleged to be in violation of the anti-trust law, and the action of the roads is claimed to be a boycott. It is charged in the bill that the boycott will destroy the Clover Leaf's passenger traffic, and another clause is quoted as saying that "it will obstruct the operation of the road by causing accumulation of traffic" upon its lines. As traffic that is destroyed does not accumulate, this statement is rather puzzling. The date fixed for a hearing is Dec. 1, but the defendants have leave to move to dissolve the injunction at any time, and they have asked that a hearing be appointed at the earliest possible date. Thus far we have not heard of any injunction against other companies than the three above named.

In addition to the foregoing arguments, the complaint in this case avers that the three defendant roads are in contempt of the court which operates the Toledo, St. Louis & Kansas City. If this charge should be sustained, the judge might fine them $20,000 apiece and tell the lawyers to save their breath for other cases; but this argument is probably put in chiefly for filling and the case will probably be fully argued on its merits. The principle involved is highly important, and the decisions upon it in cases heretofore brought before the courts have hinged upon rather fine points; but there is no apparent peculiarity in the conditions of the traffic interchanged between this weak road and its connections which should lead to any judicial opinion different from that which has heretofore prevailed.

The most important decisions touching cases of this kind are (1) that of the Interstate Commerce Commission (by Commissioner Schoonmaker) in the Chicago & Alton case July 14, 1887; (2) that of the Interstate Commerce Commission, March 25, 1889 (by Commissioner Walker) in the Little Rock & Memphis case; (3) that of the United States Circuit Court of Appeals, April 12, 1894, in the case of the Oregon Short Line vs. Northern Pacific; (4) that of the Interstate Commerce Commission (Chairman Cooley) in the New York & Northern case May 6, 1891; and (5) that of the United States Circuit Court (Judge Williams) in the case of the Little Rock & Memphis against the Iron Mountain, Jan. 5, 1894. Commissioner Walker's opinion was afterward sustained by United States Judge Hammond. The Oregon decision (by Judge McKenna) was an affirmation of a previous decision by Supreme Court Justice Stephen J. Field, sitting in the Circuit Court. Judge Cooley's decision was sustained by Judge Lacombe in the United States Circuit Court May 31, 1892.*

In all these cases, except the New York & Northern, it was held that in the absence of a contract between two roads, they could not be compelled to sell through tickets over each other's lines. Commissioner Walker found that the Little Rock & Memphis *ought* to be more favorably treated by its connections, but he said that the law gave no power to enforce such a decision. The Interstate Commerce Commission in its annual report told Congress that the law ought to be amended, but Congress has never done anything about it.

In the New York & Northern case the interchange facilities and the through rates (freight) were all well established and in operation (the defendant, the New York & New England, had s mply backed out of the agreement because it desired to favor the Housatonic) and the Commission, finding that the public interest required the through route to be maintained, held that the New England could not ask shippers to leave the New York & Northern and patronize the Housatonic. This attempt to influence shippers, and other circumstances, led Chairman Cooley to decide that the third section of the Interstate Commerce law condemned the conduct of the New England road; and Judge Lacombe sustained the Commission; but all the other decisions have leaned strongly the other way. Judge Williams' discussion of the questions involved is quite thorough, embracing the essential features of the other decisions. He shows that the enforcement of an order like Chairman Cooley's would be attended by many difficulties and encounter constitutional obstacles.

The English law on which Mr. Walker based his opinion in 1889, that the East Tennessee ought to sell tickets over the Little Rock road, requires railroads to make contracts for through business against their will when the public interest unmistakably demands it; and Judge Cooley decided against the New York & New England because he held that it was depriving the public of a needed facility; but these cases do not seem to afford much comfort for the Clover Leaf. The courts in this country jealously protect the freedom of contract, and the Interstate Commerce Commission having held (except in the single case of the New York & Northern) that it had no machinery by which to compel one railroad to make or continue a contract with another, the present case is not likely to be held to warrant any weakening of the present position of the courts.

The common-sense view of the present case indicates that law and justice will here be consistent with each other. It is not reasonable to believe that the Joint Traffic roads have accused the Clover Leaf of irregular practices without good evidence, and if the latter is a persistent rate cutter, even if its cuts are not deep, it is violating both the letter and the spirit of the Interstate Commerce law.

If the Joint Traffic roads were maliciously conspiring to unjustly injure the Clover Leaf's business, and *if* the anti-trust law were drawn in such terms that the lawyers could agree upon some construction of its main provision which would make it mean something definite, Receiver Peirce might make some headway under that law; but if we may judge by past judicial decisions the prospects of this are not good. The Interstate Commerce Commissioners will probably say that the Joint Traffic Managers ought to have entered a complaint against the Clover Leaf in the courts, under the criminal clause of the Interstate Commerce law. If the evidence is such as would convince an average jury, this view has some force; but as long as the other course of, withdrawing business, is legal and effective, no objection can be made to it.

*Further reference to the Chicago & Alton case will be found in an article in another column, by a Western railroad officer (one whose road is not interested in the present controversy).

Light Railroads in England.

The Light Railway bill was successfully piloted through its remaining stages in the last days of the Parliamentary session and received the Royal assent on Aug. 14. Though in its main features the act as finally passed differs but little from the bill as originally brought in, yet the matter is of such importance and the changes made illustrate so well the tendencies of modern legislation in Great Britain that it may be interesting to consider it at some length.

In the first place there is an extension of the principle of government aid. Light railroads are to be exempted from the passenger duty levied on ordinary railroads. Grants of public money may be made for lines intended to benefit not only agriculture or fisheries, as originally proposed, but also "for the development or maintenance of some definite industry." Further the rate of interest on state loans is reduced to 3½ per cent.

In the next place, in spite of strong opposition in the House of Commons, the local authorities of counties, districts and towns have succeeded in obtaining power either to construct and work light railroads themselves, or if they prefer it to subscribe to, or lend money to, light railroad companies. Indeed, in one respect local authorities occupy a specially privileged position, for, whereas in the case of application by a company the refusal of the Light Railway Commissioners to approve the scheme is final, a local authority is empowered to appeal from the Commissioners to the Board of Trade. On the other hand a local authority which desires to construct and work the line itself must find the whole of the funds, for Treasury advances whether on loan or as a gift may only be made to companies.

Further, great care is taken that no local authority shall lightly enter on so new a task as railroad management. The resolution to construct and work, or to subsidize, a railroad is only valid if two-thirds of the members present and voting at a special meeting called with a full month's notice concur in it; any money borrowed for railroad purposes must be repaid within 60 years at the furthest; and the demand notes delivered to the ratepayers, quarter by quarter, must state distinctly how much of the total rate demanded is for railroad expenditure. Another provision under this head is that the Treasury may stipulate as a condition of assisting a light railroad company that the local authority shall not assess the railroad at any value higher than the value of its land before the railroad was made.

The provisions dealing with the acquisition of the land necessary for the undertaking reflect the spirit of the age in emphasizing the landowner's duties rather than his rights. Before state aid is given to a line the Treasury must be satisfied that "landowners have, by the free grant of land or otherwise, given all reasonable assistance in their power." A special clause enables the owners of entailed estates to convey outright in fee simple, land in which they have only a life interest. A very important provision enables an arbitrator for the first time to set off against the value of any lands compulsorily taken "the extent to which the remaining and contiguous lands belonging to the same proprietor may be benefitted by the proposed light railroad." Moreover, the proceedings for the compulsory taking of land are simplified and rendered less expensive. The act appears also to make other important alterations of the general law under this head, but its provisions are so far from clear, and the language of section 12 seems so inconsistent with that of sections 13 and 14, that it is wiser not to express any opinion now as to their scope and effect.

A clause introduced at the instance of the existing railroad companies provides that "a junction of a light railway with any existing railway shall, so far as is reasonably practicable, avoid interference with lines of rails used for passsnger traffic." Other new clauses enact that no light railroad shall interfere with any common, destroy or injure any building or other object of historical interest or injuriously affect any natural scenery; and that where it is found absolutely essential to take common land, other land shall, if possible, be bought and added to the common in lieu of it.

It now remains for the Board of Trade to issue rules regulating the procedure to be observed in applying for powers to construct a light railroad and for the Light Railway Commissioners and the Board of Trade to give some indication of the standard of technical requirements which they propose to enforce. On this latter point these two authorities are left with an absolutely free hand, as the existing code of law which governs questions of public safety and is known as the Railway Regulation Acts does not apply to the new light lines.

Another code of railroad law, dealing with questions of tariffs and commercial working and known as the Traffic Acts, is unfortunately specially declared to govern these undertakings to which it is largely inapplicable. Two instances may be given. The Traffic Act of 1854 may be used to compel a petty local line to quote through rates for goods and through fares for passengers to every station in the British Isles, and the Traffic Act of 1894 will expose a new company to prosecution if, after trying a low scale of rates and fares for the first three months, it finds itself constrained, in order to meet its liabilities, to raise them. Still, on the whole, there is every reason to look for much benefit to the country from the new act. The newspapers are full of light railroad discussions and light railroad projects, and we shall doubtless soon see definite steps taken in many parts of the kingdom.

In Scotland, indeed, the question has already been raised in an interesting form. The Great North of Scotland Company is a small but very enterprising company with some 400 miles of line in the fertile but mountainous county of Aberdeen on the northeast coast of Scotland. Its principal officers have lately been round Europe studying Continental light railroad development, and as one result the company has expressed its readiness to undertake the construction of a number of light railroads centering in Aberdeen. Aberdeen, however, is from its geographical position not a very easy town to bring railroads into. And accordingly with the object of obtaining convenient entrance at a reasonable price for its projected lines the Great North has agreed with the existing street tramways company to purchase its undertaking if the sanction of Parliament can be obtained. Now that sanction, it is safe to say, will not be given if the Aberdeen Town Council oppose. Public opinion in Aberdeen is naturally much exercised on the question. On the one hand, the Aberdonians are not inclined to hand themselves over body and soul to the railroad company; on the other hand, unless the Great North is allowed to take the tramways, they are likely to go without their light railroad for some time to come.

Altogether, from many points of view, this movement is one of singular interest socially and commercially.

September Accidents.

Our record of train accidents in September, given in this number, includes 45 collisions, 64 derailments and 7 other accidents, a total of 116 accidents, in which 54 persons were killed and 179 injured. The detailed list, printed on another page, contains accounts only of the more

important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

Collisions.	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	9	0	0	9
Misplaced switch	4	0	0	4
Failure to give or observe signal	3	1	0	4
Mistake in giving or understanding orders	0	5	0	5
Miscellaneous	0	1	3	4
Unexplained	4		8	19
Total	20	14	11	45

Derailments.			
Defective bridge	1	Runaway	1
Defective track	1	Landslide	1
Broken wheel	2	Malicious obstruction	5
Broken axle	10	Accidental obstruction	2
Broken drawbar	1	Unexplained	30
Air-brake pipe	1		
Misplaced switch	7		64
Careless running	2		

Other Accidents.	
Boiler explosion	2
Cars burned while running	2
Breakages of rolling stock	1
Other causes	2—7
Total number of accidents	116

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	2	0	2	2
Defects of equipment	9	14	3	26	22
Negligence in operating	17	10	3	30	25
Unforeseen obstructions	0	8	1	9	8
Unexplained	19	30	0	49	43
Total	45	64	7	116	100

The number of trains involved is as follows

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	17	14	2	33
Freight and other	58	50	5	113
Total	75	64	7	146

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	14	14	2	30
Passengers	0	9	0	9
Others	4	7	4	15
Total	18	30	6	54
Injured:				
Employees	41	26	3	70
Passengers	19	87	0	106
Others	1	2	0	3
Total	61	115	3	179

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	9	76	1	3
Defects of equipment	0	9	3	4
Negligence in operating	0	19	16	44
Unforeseen obstructions and maliciousness	0	2	2	4
Unexplained	0	0	8	15
Total	9	106	30	70

Thirty-one accidents caused the death of one or more persons each, and 25 caused injury but not death, leaving 60 (52 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with September of the previous five years shows:

	1896.	1895.	1894.	1893.	1892.	1891.
Collisions	45	50	47	77	103	159
Derailments	64	54	91	75	84	92
Other accidents	7	4	8	6	6	6
Total accidents	116	108	146	158	203	237
Employees killed	30	25	30	32	68	54
Others killed	24	13	20	47	25	11
Employees injured	70	53	84	101	110	95
Others injured	109	126	42	99	125	103
Passenger trains involved	33	42	61	59	74	75
Average per day:						
Accidents	3.87	3.60	4.87	5.26	6.77	7.90
Killed	2.13	1.27	1.67	2.63	3.10	2.16
Injured	5.97	5.97	4.20	6.67	7.83	6.60
Average per accident:						
Killed	0.47	0.25	0.34	0.50	0.45	0.52
Injured	1.54	1.65	0.86	1.26	1.15	0.77

We have to report this month seven passengers killed (or fatally injured) in a single train accident, that at Arcata, Cal., on the 13th; though being on an obscure road, one so small that it does not appear in the *Official Guide*, the disaster has doubtless already dropped out of the memory of most of those who read of it in the daily newspapers at the time. The cause seems to have been the failure of a bridge, without derailment or any immediate cause other than the sheer weakness and instability of the structure itself. According to a local paper the bridge was 600 ft. long and failed when the train (a short one) had run upon it nearly to the middle, the engine and three cars apparently being then all upon one span. It is said that the train was running only about five miles an hour at the time. A coroner's jury reported that the bridge timbers were badly decayed and unfit for service. The one other accident in October which resulted in fatal injury to passengers appears to have been due to a defect of roadway. The most serious accident of the month due to negligence in the transportation department was the butting collision on the 8th near Longwood, Ind., in which three men were killed. So far as we can gather from the accounts, this collision was the result of a plain neglect of flagging rules, which neglect every man on the train was cognizant of. As the negligent men all trusted their lives upon the engine which was afterward wrecked because they neglected to protect it, it is charitable to assume that they did not know any better. Whether they were all dull-minded men and careless of the regulations, or were men of ordinary intelligence working under loose discipline, does not appear. It seems unlikely that three or more men so ignorant that their ignorance amounted to recklessness should be appointed to serve on the same train, and it is equally incredible that neglect of the flagging rules should have been habitually tolerated by the management to such an extent as to lead these men to run this risk because it was customary to do such things. Indiana has no Railroad Commissioner and we have seldom, if ever, heard of the public investigation of a train accident in that state, except by a coroner not acquainted with the details of railroad operation.

Two accidents of a class always attended with the most alarming possibilities were those of the 15th at Allegrippus, Pa., and on the 18th at Great Bend in the same state, where heavy freight trains, stopped on steep grades, were allowed to escape control and to run back down hill. Such cases illustrate the need of automatic air-brakes on the *whole train*. Railroads can comply with the law by providing 10 or 15 braked cars in the front portion of each train, but when we come to consider complete safety it is clear that we must go farther than the law requires. From the testimony of those roads which have used air-brakes longest it is clear that enlightened self-interest ought to impel every road to put air-brakes on all its cars as soon as possible.

Either on account of a lack of vigilance on the part of our scissors editor, or from a decided improvement in management, or in luck, the number of accidents on electric roads which we have to report for the month of September is unusually small, only eight, and we find no report of any person killed. The number injured was 32. Only one accident was so serious as to cause injuries which were reported as liable to prove fatal. There was the usual variety of rear and crossing collisions, running away on steep grades and careless running around curves. There was one case of a street car being run into by a freight train.

English Railroad Accident Statistics.

The number of passengers killed by train accidents in Great Britain and Ireland in the calendar year 1895 was only five, and the "general report," by Secretary Hopwood, supplementary to the statistical blue books, which has just been issued, gives figures to show that this is equal to one person killed to each 185,954,182 passenger journeys. This is the smallest proportion reported in the last 21 years and presumably the smallest ever reported. The number killed in 1894 was 16, the number of passenger journeys being only about two per cent. less than in 1895. If the journeys of the season-ticket passengers, of which no record is kept by the Board of Trade, were to be added, the proportion in 1895 would probably be one killed in about 300 million. The number of season tickets issued was about 1,200,000, this number, we take it, meaning the number of different persons traveling on such tickets. Estimating that each one traveled to and from his business only 200 days in the year, this would make about 480 million journeys, or more than half as many journeys as those of all other passengers. If the average length of journey was 10 miles (the average passenger journey in New England is about 16 miles) the number of passenger miles to each person killed was about three billions, so that a person living 10 miles out of London and going to and from his business 300 days in a year would have to travel 500,000 years before he could get killed. If a person deemed this excessive safety tiresome, he might go to Aberdeen daily (540 miles and back) on one of those fast trains, and then, if the law of averages stood by him, he would meet his fate in 8,876 years.

The principal statistics given in this Board of Trade report may be summarized as follows:

CASUALTIES, ENGLISH RAILROADS, 1895.

	Killed.	Injured
Passengers, train accidents	5	399
" other causes	78	710
Employees, train accidents	12	88
" other causes	430	2,566
Other persons, train accidents	0	0
" other causes	499	258
Total, 1895	1,024	4,021
Decrease (in total) from 1894	91	99
Employees, coupling accidents	16	331
" other shunting operations	94	1,127

The number of train accidents inquired into by the inspectors of the Board during the year was 69, being about twice as many as in the previous year. But there were only three train accidents in the whole United Kingdom which were fatal to passengers and only seven others which were attended with fatal results to employees. Besides the inspectors, the Board now has two sub-inspectors, who were kept busy during the year investigating fatal and other injuries to employees and other persons from causes not connected with train accidents. The report gives the usual summary of the causes which contributed to the 69 accidents which were inquired into. As in previous years, the number under each head is very small, except that "negligence, want of care or mistakes of officers or servants" appears in more than three-fourths of the accidents. The number of persons killed and injured in coupling accidents and in other switching operations is given for 10 years. (The items given in the last two lines of the table in the preceding paragraph are included in the total of employees shown in the fourth line of the table.) During these 10 years the length of railroad has been increased 1,761 miles and the number of employees has also largely increased, but the number of casualties has remained stationary or has decreased. The proportion of fatal accidents in 1895 was one to every 1,052 persons employed and of non-fatal one to every 175. Of brakemen and goods guards the number killed was one in 340 and of injured one in 24. Among shunters there was one killed to every 273 employed and one injured out of every 21.

This report also has brief chapters on the block system and on continuous brakes. The block system is now in effect on practically all of the double track railroad in the United Kingdom (11,252 miles); and of the 8,774 miles of single track road, 7,694 is operated on the block system, mostly combined with the train staff system. No less than 4,737 miles of single track road, more than half of all in the kingdom, is operated under the electrically controlled train staff or tablet. The percentage of passenger train vehicles now fitted with train brakes is 94, and the percentage fitted with pipes and connections only is, five.

In his concluding remarks Secretary Hopwood calls attention to the fact that although the inspecting officers deem it their duty to place the blame for disasters where it belongs they do not forget the great service performed by the army of railroad employees; when compared with the great mass of responsible duty to be performed the lapses from duty are almost infinitesimal. "The Board of Trade are always much impressed" by the dangers which employees are subject to, and they give special attention to methods which will enhance the safety of the men. In connection with the inquiries made by the sub-inspectors the Board has frequently found it advisable to recommend better lighting in yards where night work is done, also improved working regulations, and the covering of switch rods and signal wires. A table is given showing the number of recommendations under these heads which have been made to each of the principal railroads. The railroads have been urged to provide brake handles on both sides of freight cars so that trainmen will not have to pass between cars for the purpose of applying the brakes.

About a dozen pages of this report are taken up with notes of the details of the train accidents inquired into These we hope to discuss more at length in a future issue.

Annual Reports.

Rio Grande Western.—The report for the year to June 30 shows a material improvement over the operations reported in 1895, the surplus above fixed charges June 30, 1896, being $241,438, against $40,000 in 1895. The tonnage carried was 16 per cent. more than in 1895 and 6½ per cent. more than in 1892. The gross earnings have not yet reached the total reported that year, for there has been a decline in the ton-mile rate of 18 per cent. from .0195 cent to .0141 cent. Net earnings, however, are but $17,000 less than in 1892, and both in total amount and per mile of road are considerably larger than in any other year since then, as will be seen below:

	1896.	1895.	1894.	1893.	1892.
Net earn	$957,961	$743 447	$724,305	$893,315	$975.589
Net earn. per mile	1,849	1,431	1,395	1,738	2,028

The gross earnings in 1896 are 12.2 per cent. greater than in 1895 and net earnings are 28.8 per cent. greater. A few comparative figures of general operations follow:

	1896.	1895.	Inc. or dec.	P. c.
Freight	$1,760,828	$1.612,931	I. $147,896	0.91
Passenger	555,193	443,047	I. 112,146	25.3
Express, mails and mis.	141,336	133,711	I. 7,624	05.7
Total earnings	$2,457,358	$2,189,691	I. $267,667	12.2
Maintenance of Roadway	233,517	213,438	I. 20,078	09.4
Bridges and buildings	87,765	64,641	I. 23,123	35.7
Rolling stock	194,609	211,891	I. 17,281	08.1
Conducting transportation	856,526	831.243	I. 25,283	03.0
Total working expen	1,499,396	1,446,243	I. 53,153	03.6
Net earnings less taxes and insurances	869,658	667,092	I. 202,566	30.3
P. c. of working expen., taxes & insurance	64.61	69.53	D. 04.92	

Maintenance of roadways and structures absorbed more than 81 per cent. of the increase in operating expenses. New cross-ties and bridges and culverts account for $37,000 of the increase in these items. Liberal expenditures on rolling stock last year enabled the company to save something on this account, while maintaining all equipment in standard condition, with an increase of over 10,000 train miles. The passenger miles increased 26.6 per cent. and freight miles 7 per cent., but the increase in cost of conducting transportation is only 3 per cent. The increased expenses in this item to the increased earnings are about 9 per cent.

The charges to betterments during the year were $129,865, the principal charges to this account being $91,500 for relaying 40 miles of 30-lb. rails, on the San Pete branch with 56 and 57-lb. rails, the old rails being used on the extension of the Sevier branch to Richfield, Utah. This extension is 37 miles long through a fertile valley, and will reach the Marysvale gold-mining district. The first 17 miles were operated on July 1, and the rest of the line has since been completed. Only part of the cost of construction of this line is included in the present report, but the entire line will be acquired by the Rio Grande Western without the issue of any securities for which it is responsible and without assuming any indebtedness.

President Palmer has some interesting remarks on the development of the freight traffic of the road, and particularly in fuel, ore and bullion. The revenue from these three classes in 1896 was $784,475; in 1892, the year previously earning the largest revenue in these items, earnings were $777,939. Shipments show an increase of 5,000 tons in 1896 over those in 1892, and as regards ores alone the shipments have increased from 128,000 tons in 1893, the largest previous year, to 153,000 tons, and revenue

from $210,543 to $292,289. The gain is 19 per cent. in tonnage and 39 per cent. in revenue.

The men employed in the shops of the Austrian-Hungarian State Railroad Company on the 23d of September demanded that the contract system in the shops be abolished, and some other changes be made. The company refused to abolish the contract system, but was willing to reduce the hours of the day's work from 10 to 9½. The men then voted, 370 against 126, to strike. The whole number of shop employees, however, is about 1,300, and the meeting thought it unwise under the circumstances to declare a strike. We do not remember that there has ever been such a movement before among Austrian railroad employees; but the men are organizing, and four different organizations united to call a congress of railroad employees, to be held Oct. 2, 3 and 4. Two of these organizations are affiliated with the Socialistic party; another is a mutual aid society of locomotive engineers. The delegates to this congress were all granted leave of absence to attend, which has not been the case under similar circumstances heretofore. The Minister of Railroads and the railroad companies were asked to send representatives.

NEW PUBLICATIONS.

Block and Interlocking Signals, by W. H. Elliott. 277 pages, 6 in. × 8¾ in. New York: *Locomotive Engineering*, 1896. Price, $3.

The title page states that the author of this book holds the position of "Sig. Eng. C. M. & St. P. R. R." and he gives notes on his experience in the erection, inspection and care of signals. Evidently this experience has been considerable and has been well improved, and Mr. Elliott seems to be intelligent and of an investigating turn of mind. He also gives brief descriptions of Fry & Basford's, Lattig's, Kinsman's and other signaling devices not widely known, with some information about their working. But having said this much we are bound to say that as a whole the book is unsatisfactory. The list of contents mentions all the prominent automatic and non-automatic signal apparatuses made in this country, shows a chapter on regulations for operation and one on contracts and specifications, but the several descriptions are sketchy and incomplete. If the work aims to be a comprehensive description of all kinds of fixed railroad signals and of the methods of signaling trains, it ought to be a well-classified book of reference for the experienced (it has no index) and a manual of instruction for the inexperienced; but it is doubtful whether the author had either of these purposes clearly in mind, and it is hard to discern just what class of readers he did have in mind. There are many pictures, mostly direct-process, but they are not well classified, and the descriptive matter savors somewhat of the daily newspaper style (though an exception to this is the abbreviation of railroad names, as in the author's title; no reporter is so careless as that). The author's spirit is eminently fair, but his criticisms often appear superficial, and his statements lack precision. One of the most attractive chapters is that giving examples or estimates of the cost of erecting and maintaining block signals of different kinds and of operating the block system; but the attractiveness proves to be delusive, for the figures are loose estimates, or so incomplete as to be of scarcely any value.

In spite of these defects the book has value as a collection of material on the subject of signaling such as can be found in no other book except the catalogues of the signal companies. The descriptive books of our American signal manufacturers are very complete, and are more free from prejudice than most publications of the kind; but there is an advantage in having a comparison of different devices, made by an impartial writer, and this is the chief merit of Mr. Elliott's work. So far as we have noticed, he aims to give perfectly just views in every case where two or more devices, whether made by rival companies or otherwise, may be used for the same purpose.

Journal of the Western Society of Engineers. Published bi-monthly by the Society, 1,737 Monadnock Block, Chicago. Subscription price, $2 per volume of six numbers.

Volume 1, No. 4, of the *Journal of the Society* contains an article on "Deep and Difficult Bridge and Building Foundations," by Mr. George F. Thomas, which was read before the society at its meeting on May 6. The article is illustrated by nine half-tone reproductions and two line drawings. The paper consisted essentially of a history of the foundation building for several well-known bridges and buildings, among others being those for the Chesapeake & Ohio bridge, crossing the Ohio River between Cincinnati and Covington; the Plattsmouth bridge, over the Missouri River; the Harlem River bridge at 155th street, New York City; the Manhattan Life Insurance Building in New York City, and Illinois Central Depot and new Stock Exchange Building in Chicago.

The *Journal* also contains a full reprint of "The City & South London Railway, with Some Remarks Upon Sub-Aqueous Tunneling by Shield and Compressed Air," by the late Mr. James H. Greathead, M. Inst. C. E., which first appeared in the *Minutes of Proceedings of the Inst. of C. E.*, Vol. CXXIII., issued March, 1896.

TRADE CATALOGUES.

A Compressed Air Ditcher and Wrecking Car.—The American Steel Foundry Co., 509 Olive street, St. Louis, Mo., sends us a pamphlet descriptive of the "American Compressed Air Railway Ditcher and Wrecking Car," which was designed by Mr. W. B. Doddridge, General Manager of the Missouri Pacific, and which is built and sold by the American Steel Foundry Co. It is a 50-ft., steel frame, platform car with a lifting crane commanding the entire deck of the car and having at each end two transverse plow-guide cylinders and provided with a plow, scraper, scoop and shoulder former. The car carries the tools and guides them in their work and is hauled by a locomotive. The train and plow guides can work by air cylinders placed under the floor, the power being supplied by the air pump on the locomotive and the compressed air stored in drums under the floor. The plow, the scraper, the scoop and the shoulder-former are lifted on and off the car by the crane. They are adjusted and held at the required distance from the car and are hauled forward by their attachments to it as the car is hauled by the locomotive.

The Alleged "Boycott" of the Toledo, St. Louis & Kansas City.

BY A RAILROAD PRESIDENT.

The question between the Clover Leaf line and the lines of the Joint Traffic Association should call for a strong decision from the courts and thus materially strengthen the association, and repress rate cutting. The issue is quite simple. The associated lines are maintaining absolutely their rates and regulations governing passenger and freight traffic. The Clover Leaf, which is an outside competitive line between St. Louis and Toledo delivering Joint Traffic business to the Association lines at various junction points, is claimed to be a persistent rate-cutter; in other words, to constantly obtain traffic by concessions to passengers and to shippers of freight, disregarding its own published tariffs, which are identical with those of the association lines. This being the case, the latter lines refused to exchange traffic with the Clover Leaf, beginning with passenger business and announcing a purpose to cease exchanging freight business also unless the methods of the Clover Leaf are corrected. The Clover Leaf thereupon brings suit to compel the resumption of traffic exchanges.

This is a measure which has twice been adopted by the Eastern lines against the Chicago & Alton for various reasons, principally having reference to the payment of commissions on passenger business in Eastern territory, and which the Alton has delighted to call a boycott, although I cannot see the appropriateness of the term in this connection. On the first occasion the Alton brought proceedings before the Interstate Commerce Commission to compel the interchange of traffic under Section 3 of the Interstate Commerce law. The commission ruled in substance that the section referred to would not support the affirmative relief desired; that the exchange of business involving agreements for the division of rates as well as for the collection of moneys and settlement of accounts, each party being made an agent of the other, was essentially a matter of contract; that unless both parties agreed, no contract existed, and that there was no power under the Interstate Commerce Law, or otherwise, to compel parties to enter into a contract of that character against their will. This has been, in substance, the decision of the commission and of the courts in various other cases which have since arisen, involving analogous questions.

In the present case, so long as all that is desired of the Clover Leaf is for its Receiver to deal fairly, justly and honorably with the public, and to maintain his own rates and schedules as required by law, it is difficult to see how the courts or the public can feel any sympathy with his effort to compel the lines of the Joint Traffic Association to continue contract relations with him against their will.

Annual Convention of the American Street Railway Association.

(*Concluded from page 755.*)

J. M. Atkinson & Co., Chicago.—The horseshoe rail-bond and the Waterman rail drill.

Berry Bros., Detroit, Mich.—Full line of varnishes.

Bethlehem Iron Co., South Bethlehem, Pa.—Photographs of large castings and a solid steel forged shaft 23 ft. 6 in. long by 28 in. in diameter in the largest part, and 22 in. on the journals, and weighing 15 tons. This shaft is of fluid-compressed, open-hearth steel, forged on a mandril.

J. L. Black, St. Louis.—Automatic fulcrum hand brake.

R. Bliss Manufacturing Co., Pawtucket, R. I.—Woods' patent car gate.

Bradford Belting Co., Cincinnati, O.—"Monarch" insulating paint.

Bowers Bros, Chicago.—Mica for insulating purposes.

J. G. Brill Co., Philadelphia.—Electric sweeper, Brill's Maximum Traction Truck, Dunning drawbar, ten-seat open car on a No. 21 E single truck, No. 27 double truck, No. 28 truck under car of Brownell Car Co.'s exhibit on a No 21 E truck and models of different patterns of trucks.

Broderick & Bascom Rope Co., St. Louis.—Cable rope and special wagon of 14,000 lbs. capacity for laying cables.

C. B. Bray, St. Louis.—Model of the Staebler automatic car fender.

The Brooklyn & New York Railway Supply Co., Elizabeth, N. J.—Bronze-trimmed fare registers and other apparatus applied to a car in the exhibit of the Peckham Motor Truck & Wheel Co.

Harold P. Brown, New York.—The plastic alloy rail bond.

Brownell Car Co., St. Louis.—Car seats and a 3 E truck. Also a full size street car equipped with the Goodrich gates, which are operated by the motorman.

Brussels Tapestry Co., Chauncey, N. Y.—Car curtains and the "Perfect" self-adjustable curtain fixtures.

W. M. Buck Mfg. Co., St. Louis.—"Rainbow" beltings, car curtains, headlights and other apparatus for street cars.

E. T. Burrowes Co., Portland, Me.—Samples of curtains for street cars and curtain materials and fixtures, including the waterproof material "Oakette."

H. B. Camp Co., Aultman, O.—Vitrified clay conduits.

W. H. Carter, Chicago.—Draw-bar.

Central Electric Co., Chicago.—Representing the Interior Conduit and Insulation Co. of New York City, whose system of wiring cars was described in our issue of March 20 last; the Oknite Co., of New York City, and the Billings & Spencer Co., of Hartford. Complete line of appliances for steel cars.

Central Electric Co., Pittsburgh, Pa.—De Witt "Common-Sense" sand-box and other apparatus of the Southern Electric Supply Co.

Central Union Brass Co., St. Louis.—Reels of Washburn & Moen's wire for magnets, lead-covered wire for underground uses, "Figure 8" 000 trolley wire, the Chicago rail-bond, drop forged commutator bars, mica, trolley hangers and a complete line of brass material.

Chapman Value Manufacturing Co., Indian Orchard, Mass.—Different types of valves.

Charter Oak Stove & Range Co., St. Louis.—Heaters for street cars.

W. H. Coe Mfg. Co., Providence, R. I.—Patent gilding wheels for use in ornamenting cars.

Commercial Electric Supply Co., St. Louis.—General supplies for electric roads. Agents for Bryant Electric Co., Electric Engineering & Supply Co., Perkins Electric Switch Co., Wagner Electric Manufacturing Co., and others.

Columbia Machine Works, Brooklyn, N. Y.—Drop-forged copper commutator bars and a commutator assembling machine and other specialties.

Consolidated Car Fender Co., Providence, R. I.—Patent car fender.

Corning Brake-Shoe Co., Corning, N. Y.—Samples of brake-shoes.

Consolidated Car-Heating Co., Albany, N. Y.—Heaters arranged to illustrate application to electric street cars. These heaters can be regulated by a switch to five different degrees of heat.

Consolidated Electric Purifying Co., Chicago.—Automatic electric feed water purifier.

Crane Co., Chicago.—"Globe" and angle-valves of all sizes, the largest made for 24-in. pipe, weighing 6,500 lbs.

Creaghead Engineering Co., Cincinnati.—Complete exhibit of material for street cars and line construction, including the Creaghead flexible brackets.

Edgar M. Davis, St. Louis.—Model of an automatic switch-thrower.

Detroit Stove Works, Detroit, Mich.—"Jewel" car-heater in six styles.

Devlin Street Car Brake Co., Memphis, Tenn.—Model of the Devlin power and safety brake.

Diamond Truck & Car Gear Co., Kingston, N. Y.—No. 5 and No. 3 trucks and the Hyatt flexible roller bearing.

George Diets & Bro., St. Louis.—Conductors' caps and coats.

W. W. Doty & Co., New York City.—Switch moved by a bar connected by levers to the core of large magnets.

Duff Manufacturing Co., Allegheny, Pa.—Four Barrett track and level jacks.

Dusenbury & Bond, New York City.—Upholstery for cars.

Electric Insulating Co., St. Louis.—"Peerless" armature compound.

Electric Storage Battery Co., Philadelphia.—Chloride accumulators.

Elliot Frog & Switch Co., E St. Louis, Ill.—Tongue switch, mate and frog; Elliot steel clamp frog, Doddridge clamp rail joint, model of "Eureka" rail frog and three-throw switch operated by a Hasty stand.

Evens & Howard Fire Brick Co., St. Louis.—Variety of fire bricks for power stations.

J. S. Everett.—Model of a brake made by the Track Brake Co.

Falk Mfg. Co., Milwaukee, Wis.—Cast-welded rail joints.

Fletcher & Stone, St. Louis.—Flexible trolley suspension and hanger and automatic cut-out for releasing a broken trolley wire.

Forest City Electric Co., Cleveland.—Commutator bars.

The Fitzgerald Van Dorn Co., Chicago.—Car couplers.

Gold Street Car Heating Co., New York City.—The Gold electric heaters for street cars, illustrated in our issue of May 29.

Hale & Kilburn Mfg. Co., Philadelphia.—"Walk-over" and reversible car seats of three different styles.

Heine Safety Boiler Co., St. Louis, Mo.—Full size boiler and model of the Heine safety boiler.

Hunter Automatic Fender Co., Cincinnati, O.—A new automatic car fender and illuminated signs for street cars.

General Electric Co., Schnectady, N. Y.—Different types of standard apparatus made by the company, and especially the latest devices developed since the last convention. A G. E. 1,000-motor mounted on a truck and shown in operation with an electric brake. One of the Brooklyn Bridge car trucks was also exhibited. The controller section included examples of the K 10, B 6 and L 2 controllers, as well as one of those used on the 96-ton electric locomotive similar to the one in use on the Baltimore & Ohio Railroad; two rotary converters, each of 100 K. W. capacity, arranged so as to show the method followed in the three-phase long-distance transmission work and the manner in which power from Niagara Falls is to be delivered to the Buffalo City Railroad.

International Register Co., Chicago.—Double, single and portable fare registers.

Jewell Belting Co., Hartford, Conn.—Pulley covering and belts.

George P. Jones & Co., St. Louis.—Car-wheel oil and grease.

The Johnson Co., Johnstown, Pa.—Extensive exhibit of rail joints and rail crossings.

Kinzer & Jones Mfg. Co., Pittsburgh, Pa.—Exhibit of the Kinzer brakeshoe, illustrated and described in our issue of Oct. 16.

Kraushaar Lamp & Reflector Co., St. Louis.—Attractively arranged collection of lamps and other appliances for street cars.

Leonhardt Wagon Mfg. Co., Baltimore.—Three electrical emergency towers.

Leschen-Macomber-Whyte Co., Chicago.—Line wire and cables of different sizes and materials.

Linburg, Sickel & Co., Trenton, N. J.—A "Trenton" repair wagon for use in overhead line construction and repair.

Ezra H. Linley, St. Louis.—Exhibits of apparatus from Cambria Iron Co., Bridgeport Brass Co., Wm. Jessop & Sons, Scofield Bolt Co., Columbia Screw Co. and Detroit Steel Spring Co.

J. C. McGraf, St. Louis.—Model of a new car-brake.

McGuire Mfg. Co., Chicago.—Columbia street-car heater; full-size truck, with pivotal motor and a combined snow plow and sweeper.

McLennan & Co., Chicago.—Gale's commutator compound.

John T. McRoy, Chicago.—Terra-cotta materials for conduits.

Mark Railway Equipment Co., Chicago.—Special styles of rails, cables, track joints, rail chairs, double and single rail brace plates, tie plates and other track specialties.

John Marsh, St. Louis.—Model of a new track switch-shifter, operated from the floor of a platform of a car by the motorman.

Mason Electric Equipment Co., Chicago.—Overhead line specialties and poles and brackets for electric roads.

Meaker Mfg. Co., Chicago.—Overhead line materials and portable and stationary street-car fare registers.

Meeker Mfg. Co., North Chicago, Ill.—Various types of street-car fare registers.

Mica Insulator Co., Schenectady, N. Y.—Mica for insulating purposes.

Eugene Munsell & Co., New York City.—Mica and copper segements for electric railroad motors.

Michigan Stove Co., Detroit, Mich.—The Garland street-car heater.

Mississippi Glass Co., St. Louis.—Woven wire glass and ornamental glass for street cars.

Missouri Car & Foundry Co., East St. Louis, Ill.—Specimens of chilled iron, car wheels and brake-shoes.

Missouri Malleable Iron Co., St. Louis.—Samples of castings for railroad work, including truck frames, axle boxes and drawbars.

Morrell Electric Works, St. Louis.—Commutators.

Munson Electric Conduit Co., Chicago.—Model of electric conduit system in operation on a 60-ft. track. This system was illustrated and described in the *Railroad Gazette* Aug. 7, 1896.

Murphy Varnish Co., Newark, N. J.—Large exhibit of varnish.

National Carbon Co., Cleveland, O.—Carbons for electric lighting and transmission, including carbon brushes.

National Lead Co., New York.—Large variety of lead products; also Babbitt metal.

National Jack Co., Boston, Mass.—Pearson's Hub car replacing jack.

National Malleable Castings Co., Cleveland, O.—Large variety of castings and appliances for street railroads.

New Haven Car Register Co., New Haven, Conn.—Single, double and triple fare registers.

New York Belting & Packing Co., New York City.—Interlocking rubber tiling, "Vulcan" spiral piston packing and "Ruby" sheet packing; also moulded rubber work and matting for street cars.

New York Car Wheel Works, Buffalo.—Car wheels and axles.

R. D. Nuttall Co., Allegheny, Pa.—Barrett patent compound lever jack, gears, pinions, bearings, trolley poles and harps; materials for overhead line construction.

Ohio Brass Co., Mansfield, O.—Complete exhibit of overhead line material, including both old and new styles of hanger bodies, eight varieties of trolley ears, bell-metal bearings and special feed-wire insulators and splicers. Also complete set of fittings for putting up "Fig. 8" trolley wire, track brush holders and special insulators for use in mines.

Partridge Carbon Co., Sandusky, O.—Self-lubricating motor brushes.

Arthur S. Partridge, St. Louis.—A general line of street-railroad supplies, including mica, Micanite, insulated wires, carbon brushes, gears, pinions and bearings.

Peckham Motor Truck & Wheel Co., Kingston, N. Y.—Rugg's "Rotary" snow plow, 7C "Excelsior" truck with the Kilgour emergency brake; 8A "Improved Standard" truck and No. 11 double cushion "Swivel Truck," "Improved" 9A truck with Westinghouse 38B motors operated by the Shelton rheostat; also 9A truck with Westinghouse No. 12 motors; "Improved Extra Long" 9A truck with G. E. 1,000 motors and electric brakes.

Pennsylvania Railway Supply Co., Pittsburgh, Pa.—Commutators, gears and pinions and general electrical supplies, especially for overhead trolley construction.

Phœnix Carbon Manufacturing Co., St. Louis.—Carbons for electric motors and electric lights.

Pittsburgh Car Wheel Co., Pittsburgh, Pa.—Exhibit of a suspension street-car truck.

Pond Machinery Co., St. Louis.—Steam separators and standard rocking grate bars.

W. G Price.—Exhibit of the Price drawbar.

Q & C Co., Chicago.—The Bryant and Gold Medal machines for sawing rails; Servis tie plates and Perfection oil purifier.

Ready Rock Asphalt Roofing Co., St. Louis.—Samples of roofing material.

John A. Roebling Sons Co., Trenton, N. J.—The Columbia and Johnson rail bonds for electric roads.

Safety Car Heating & Lighting Co., New York City.—Various types of lamps employed in the use of Pintsch gas on street cars.

Safford & Moore Railway Jack Co., Chicago.—Automatic raise and lower and quick-tripping jacks.

The Sargent Co., Chicago.—Brake-shoe made of hard cast iron with spruce wood plugs and in soft cast iron with wrought-iron inserts; also, open-hearth steel castings and car couplers.

St. Louis Car Wheel Co., St. Louis.—Variety of chilled wheels and castings.

St. Louis Register Co., St. Louis.—Single, transfer, vestibule, Baumhoff double deck and New Numeral fare registers.

Sanitary Car Strap Co., Bayonne, N. J.—Clark's patent hand strap for street cars.

Robert A. Schlegel & Bro., St. Louis.—Ornamental and reflecting glasses for street cars.

Scarritt Furniture Co., St. Louis.—Large exhibit of rattan and plush upholstered seats for street cars.

Charles Scott Spring Co., Philadelphia.—Elliptical and helical springs for street cars, and springs of special design.

Security Bank Note Co., Philadelphia.—Samples of engraved railroad tickets and passes.

Shickle, Harrison & Howard Iron Co., St. Louis.—Open-hearth steel castings of cut split-gears and general machine castings of all kinds.

Shultz Belting Co., St. Louis.—Patented leather pulley covering, rawhide belting and woven link belts.

Charles G. Smith, New York City, "Smith of New York."—Combination lamp frame for electric and oil lamps.

Standard Air Brake Co., New York City.—Single-acting geared compressor, power and hand brakes, controlling head, single-acting axle-driven compressor, electric motor compressor (direct coupled) and the Standard air reservoir automatic controller.

Standard Paint Co., New York.—The "P. & B." electrical compounds for insulating wires and cables and "P. & B." motor cloth.

Standard Underground Cable Co., Pittsburgh.—Large exhibit of wire cables of all sizes.

Steel Motor Co., Johnstown, Pa.—Lombard hydraulic brake, two type C3 controller and two electric motor mounted on trucks.

Sterling Supply & Manufacturing Co., New York City.—Brakes and fare registers.

Stever Rail Joint Co., Canton, O.—Five patterns of the Stever rail joint applied to different style of rails.

D. C. Sweet Co., Springfield, Mass.—Car wheel grinding machines.

Taylor Electric Truck Co., Troy, N. Y.—The Taylor improved single truck and a pair of Empire State radial trucks.

Trojan Button Fastener Co., Troy, N. Y.—Exhibit of the Ham sand box.

Edmund Verstraete, St. Louis.—Electric brake.

Walker Mfg. Co., Cleveland, O.—An 800-K. W. armature (1,000 H. P.) one of 15 built for the Chicago City Railway Co., weighing 27,800 lbs.; Nos. 3, 5, 10 and 15 motors and two No. 3 motors on a Peckham truck; new type "El" controller; type "G" controller for electrically operated elevated trains; new ventilated rheostat and the Walker improved trolley arm and wheel.

Weber Railway Joint Mfg. Co., New York City.—Complete exhibit of Weber rail joints, including several specimens that have been in actual service.

The Wells & French Co., Chicago.—The Chicago street-car truck.

Western Telephone Construction Co., Chicago.—Complete switchboard.

Westinghouse Electric & Mfg. Co., Pittsburgh.—Standard railroad switchboard, with one generator panel, two feeder panels and one panel for bus ammeter and Weston volt meter; switchboard with Wurts automatic circuit breaker and Wurts switch; full line of Wurts non-arcing lightning arrestors and tank arrestors; two 12A motors on a Peckham truck; one truck equipped with 38B motors; a 15,000-volt, high-potential lightning arrestor; iron-clad field rheostat; generator-equalizer switch, mounted on a stand and one standard street-car choke coil.

William Wharton, Jr., & Co., Philadelphia.—Carves' long radius switch frog for special work, integral and manganese steel and the Wharton unbroken main line work.

White-Crosby Co., New York City.—Samples of tops of poles to be used in the Niagara & Buffalo power transmission line, designed to carry wires to transmit 20,000 H. P. at 10,000 volts, 5,000 H. P. to be delivered to Buffalo by Nov. 15.

Clarence Whitman & Co., New York City.—Samples of Pantasote, an imitation leather for car curtains, upholstering and lining.

Windsor Brake Co., Troy, N. Y.—Model of a patent car brake.

J. H. Wolf & Co., St. Louis.—Samples of transfer tickets now being used by the Union Depot Railroad Co.

Foreign Railroad Notes.

In an account of the Russian Exhibition at Nijni Novgorod, held this year, the following list of the locomotive and car-building establishments in Russia, aside from the shops of the railroads themselves, is given: Kolomna Machine Works, in Kolomna, near Moscow, with an annual capacity of 159 locomotives and 3,000 cars; the Brjansk Works in Bjeschizkaja, on the Riga & Orel Railroad, capacity for 120 locomotives and 3,000 cars; the Putilov Works in St. Petersburg, capacity 100 locomotives and 3,800 cars; the Malzov Works Co. in Brjansk, capacity 1,500 cars; the Lilpop, Rau & Löwenstein Co., Warsaw, capacity 3,000 cars; the Russian Baltic Car Works Co., Riga, capacity 4,000 cars; the CMoscow ompany of the Neva Engine Works, St. Petersburg, capacity 120 locomotives; the Sovmov Co., Nijni Novgorod, capacity 2,000 cars; the Wotkin State Works, Sarapul, capacity 20 locomotives; the Phœnix Co., Riga, founded in 1896. The aggregate capacity of these works is 500 locomotives and 2,000 cars yearly.

At the exhibition the Siberian Railroad had a building by itself for its exhibits, which were very numerous, including the steam car ferry for Lake Baikal, capable of carrying three trains at once, and a curious collection of Chinese tools for earthwork, wheelbarrows, etc., such as are actually in use on the Pacific end of the Siberian Railroad.

The Russian Railroads made a fine exhibit at Nijni-Novgorod, including many appliances by Russian inventors. Nearly all the passenger cars were approximately of the American type, and most of them, even third and fourth class cars, were fitted to be used as sleeping-cars. There was a great variety of special freight cars for carrying stock, racehorses, fish, fruit, milk and beer and hospital cars, including some intended for patients affected with contagious diseases.

A list of the street railroads in Russia on the 1st of August last has been published, showing an aggregate of 366 miles in 19 different cities. Most of them are still worked by horse-power, but there is a line 5½ miles long in Moscow, one 4and one 2¾ miles long in St. Petersburg and one 6¼ miles long in Odessa, which are worked by steam, while all the lines in Kieff (21 miles) and all those in ancient and oriental Nijni-Novgorod (8¾ miles) are worked by electricity. In St. Petersburg there are 66 miles and in Moscow 76 miles of horse railroad, in Warsaw 50 miles and in Odessa 35 miles. The place which stands next is Asiatic Tiflis, with 13 miles. In Nijni-Novgorod there are two mountain railroads up steep hills.

The Berlin Exhibition recently closed, was held on grounds to the east of the city on the line of a girdle railroad which encircles it. The oval space included by this girdle is nearly bisected by the elevated City Railroad. The time-table of the City Railroad and of the Girdle road, worked together as one system, was arranged particularly for the exhibition this year, most of the trains running directly to the grounds, which were one station to the south of the eastern junction of the City road with the Girdle. By the exhibition time-table, the number of trains to and from the grounds was 761 on week-days and 931 Sundays. Since the close of the exhibition the number is 304 on week-days and 279 Sundays. Trains were run at times only three minutes apart. The largest number of passengers carried to and from the exhibition by railroad in one week was 467,500.

Freight Stations for Local and Transfer Work.

BY O. P. L.

A recent article in the Ohio *State Journal* states that the Pennsylvania Lines west of Pittsburgh are "arranging to make Columbus the distinctive transfer station" for their southwestern system. It goes on to say that "the local station is not to be abolished, but that the facilities for handling local freight are to be improved." The article then proceeds to boom Columbus and the Pennsylvania Lines in a manner more enterprising than interesting, but I gather that the Pennsylvania is able in Columbus to combine the business of its local freight station with that of a freight transfer station. This means that it has command, in a location convenient for the local merchants, of more land than is necessary for the local business. Probably this is more easily managed at Columbus than at larger cities where land is dearer, but if the facilities are properly used, they should be of advantage both to Columbus and to the railroad.

Supposing that the new freight-transfer station attracts to Columbus all the freight for the local points within a radius of a hundred miles or so, this increased amount of "Columbus freight" will enable freight agents at a distance to load direct to Columbus most of the freight which hitherto has gone to intermediate transfer stations. In like manner, Columbus will be able to load through cars to many distant points to which it could not afford to send cars if the volume of business were smaller.

The movement of freight "through without transfer," which was the original drawing card of the fast freight lines, is still of importance to the merchant; and the greater the amount of other people's freight transferred *at* Columbus, the less will the freight of the Columbus merchant be transferred. This is a clear gain to him.

In all probability the new freight to be transferred at Columbus has heretofore been transferred at some other point. If the other point is a freight-transfer station pure and simple without connection with any local freight station, the change to Columbus is a clear gain to the railroad as well, for transferring freight costs money and every pound that is moved absolutely without transfer to and from Columbus costs so much less to handle.

This idea followed to its legitimate conclusion would lead to the statement that freight-transfer stations should be situated not only at the largest centers of population, but that they should be a part of the regular freight stations at such points. The price of real estate will, however, bar the largest cities from this advantage, but the service to and from cities of the second class ought to have the benefit of it. And probably the merchants and shippers of such cities need this help more than those of the largest cities, where competition compels good service.

In order to recoup expenses incurred in meeting such competition the operating department may well refuse to move cars with non-paying loads to intermediate cities of the second class. The combining of a freight transfer with the city station at such points should provide the necessary traffic to warrant first-class service.

Safety and Economy of Working a Switch and a Lock by the Same Lever.

This was the subject of the principal discussion at the meeting of the Railway Signaling Club at Chicago, Sept. 22. Mr. W. H. Elliott presided. Five candidates were admitted to membership. The letter ballot on the question as to whether the club should make recommendations of colored lights for night signaling resulted in a tie and the matter was laid on the table. The chairman was directed to appoint a committee on the subject of primary batteries as applied to signaling, to investigate and report, the report to be based upon experimental investigation. The question of the best material to be used for wooden foundations was introduced by the chairman, and will form the subject of discussion at a future meeting.

The discussion of the paper by Mr. Elliott entitled "Is the Switch and Lock Movement Safe?" (reported in the *Railroad Gazette*, Sept. 25, page 668) was opened by a communication from Mr. J. I. Vernon (N. Y., N. H. & H.). He said:

I do not consider the switch and lock movement as safe as a facing-point lock and I do not think bolt locks attached to signal wires can be made to work properly in all cases. Our switch connections are not as strong as they ought to be. In pipe joints I think the plugs ought to be longer and ought to have two rivets in each end instead of one; and they should have longer sleeves. The ⅜-in. pins used at the connection of every switch ought to have nuts and washers as well as split cotters. In fact, I am now using these pins with nuts and washers on all movable-point frogs and am going to use them at the connections to all switch points.

Mr. H. M. Sperry: The switch and lock movement, when used in connection with an efficient bolt lock, is undoubtedly safe. As to whether it is any better than the facing-point lock is another question. In England, switch and lock movements are used on one line only, the Midland. Mr. Elliott has pointed out very clearly the disadvantages of the switch and lock movement, the short stroke of the plungers and the hard working of the levers. Against this we have a saving in the first cost and possibly a little saving of time in operation. There is no saving if the levers are overweighted.

A saving in first cost is not always true economy. Some plants are costing 50 per cent. more for repairs than they should, on account of the saving that was made in their first cost. Facing-point switches, whether operated with switch and lock movements or by facing-point locks, should be fitted with bolt locks, in order to insure the greatest measure of safety. Stevens & Sons, of England, in 1884, brought out an improved bolt lock, which, in addition to detecting the position of the switch, has a connection to the facing-point lock plunger which detects its position, therefore making it necessary for the switch to be in its proper position and properly locked before any signal can be cleared.

No matter how perfect our apparatus, we are still dependent upon careful inspection and maintenance. In this connection I would like to present a code of rules that I issued in 1886—

1. The plunger should not be withdrawn more than 1 in. from the front rod through which it passes.
2. The full stroke (8 in.) of the plunger must be retained and upon no account reduced.
3. The end of the plunger must be kept square and must not be tapered; the sharp edges may be taken off, but no taper allowed.
4. The top of inside detector bar in its normal position should be 1¾ in. below the top of the rail.
5. The facing-point casting to be fastened to tie with ¾-in. bolts fitted with Verona nut locks.
6. Wrought-iron plates to be used to hold the points of the switches to accurate gage.
7. The pipe from plunger to bell-crank should run parallel with the rail.
8. To test facing-point lock: Have the switch lever pulled over, previously putting a nail or piece of iron 1/16 in. in thickness between the tongue of the switch and main rail; if the plunger of the lock can then be pushed through the hole of the front rod, the latter is incorrectly fitted and must be changed. Test the switch in the two positions. This test should be made with the plunger disconnected, so that it can be pushed in with the hand. When the switch is quite home the plunger should be perfectly free in the front rod; when the switch is 1/16 in. open the plunger should not be able to enter hole in front rod.

Mr. Cox (Hammond & Blue Island): Our Dolton plant is being put in by the Pennsylvania, and this plant will require about 140 levers. We do not have a switch and lock movement in the whole plant. In one of our plants we shall have 223 levers, and no switch and lock movements. At State Line we have one that will take about 153 levers. We have adopted the facing point lock. The oil pockets in the switch and lock movement get stiff in winter, and they are hard to keep clean and to maintain, particularly in winter when there is snow and ice. You will not find that trouble with the facing-point lock.

Mr. Wileman (L. S. & M. S.): I would not have a switch and lock movement if I could help it. I consider them a great deal more expensive to maintain, and in cold weather the slides become covered with frost. I have been making some miscellaneous tests on the pull required to move switches, and a very thoroughly maintained switch and lock movement with a fairly stiff new switch will require sometimes as high as 250 lbs. applied to the end of the slide bar to move it, whereas the lock and detector bar of a facing-point lock seldom require more than 85 lbs. I do not think switch and lock movements should require over 150 lbs.; anything beyond that indicates an overload. Shortening the switch point makes the pull harder and we have been obliged to discard the use of points shorter than 15 ft. On a new derail I have found the pull required to run up as high as 400 lbs. with the joint tightened up; by loosening the bolts, the resistance is greatly reduced. On derails we run up as high as 250 and 300 lbs. (in the open position), but I think about 175 lbs. I found the most desirable. As soon as a switch and lock movement plant begins to deteriorate, it goes to wreck so rapidly and requires so much repairing that in some cases it becomes almost a nuisance, while it is almost impossible, with any sort of care, for a facing-point lock to get into a similar condition.

Mr. RHEA (Pennsylvania): I think that a plant with switch and lock movements will [cost so much for repairs as to] lose the interest on the 25 per cent. you have saved.

THE CHAIR: The experience of the club seems to be against the use of the switch and lock movement, but beyond the matter of repairs, I cannot see that any argument is brought to bear. We have three or four plants where facing-point locks are used almost entirely, but the majority have the switch and lock movement. One of them has two movements from 900 ft. to 1,000 ft. from the tower, and it takes a good pull to throw this one. It has now been in service for five years, and I cannot remember that we have made any repairs on it at all. One point in favor of the switch and lock movement is that while with the facing-point lock it is possible for the operator to unlock the switch after the signal has been put back to danger and let the train go over switch unlocked, this cannot be done with the combination movement.

Following this a topical discussion was held on the subject of the use of selectors, in which the opinion was expressed that they are a source of danger when used for signals on converging routes. A few remarks were made by Messrs. Rhea, Elliott and Salmon on the topic, "Where automatic block signals are used, governing through the limits of the interlocking plants, what are the proper relations between the systems?"

TECHNICAL.

Manufacturing and Business.

Mr. A. O. Norton, 336 Congress street, Boston, is now on the Pacific Coast, where he reports a very good demand for the ball-bearing railroad and bridge jacks made by his firm. Additional machinery has been added to the factory to meet the increasing demands for these jacks. Some quite large orders have recently been received from the Southern States, Mexico, Canada and the Hawaiian Islands.

The Missouri, Kansas & Texas is this week attaching one of the National Electric headlights to a locomotive, with a view to their general use if the results are satisfactory.

Operations were resumed at the Hotchkiss Nut & Bolt Works, Greensburg, Pa., this week, after an idleness of several months. About 100 men are employed.

C. H. McKibbin & Co., on Oct. 24 resigned the General Sales Agency of the Cooke Locomotive & Machine Co., of Paterson, N. J.

Herr B. Schuchardt, senior member of the firm of Schuchardt & Schutte, of Berlin and Vienna, accompanied by Herr Greif, his chief engineer, recently visited the works of Messrs. Gould & Eberhardt at Newark, N. J., and inspected the shops thoroughly. Mr. Schuchardt represents large importers of machinery on the continent, who import especial American products, and is the General Agent for the Gould & Eberhardt Co. Regarding American machinery abroad, Mr. Shuchardt said: "The demand for American machinery is constantly increasing as the large European manufacturers look to this country for the latest and most advanced machinery."

The pressed steel brakeshoe keys which have been made by the Drexel Manufacturing Co. will hereafter be manufactured by the Q & C Company, and be known as the "Q & C."

The Pittsburgh Reduction Co. has completed its new rolling mill at Niagara Falls, N. Y. This mill has a capacity to roll aluminum plates 72 in. in width, and is at present working on orders for plates 60 in. in width.

The Lehigh Valley has just received a steam wrecking car from the Industrial Company, Bay City. It bears shop No. 473. The derrick will lift 30 tons within a radius of 20 ft. Within a radius of 16 ft. it will lift 50 tons.

Iron and Steel.

The Carnegie Steel Co. has recently bought 65 acres of ground in the Borough of Duquesne, from the Oliver estate, for $200,000. This tract of land lies at the lower end of the borough, north of Oliver avenue and on both sides of the railroad. The Carnegie Steel Co. has not made public what it intends to use the new purchase for, but it is said additional finishing mills will be erected, work on the first of them to be begun early next year.

The Cleveland Steel Casting Co., Cleveland, O., has begun work on an open-hearth plant at the west end of its present plant. Excavation has been begun, and it is expected that foundation work will be started soon. The building will be 250 ft. long, with a 70-ft. span. It is the intention to install two 15-ton furnaces to cast small ingots, thus obviating the necessity of blooming down.

The Shoenberger Steel Co., of Pittsburgh, is making considerable additions to its equipment. These additions will include two new steel buildings now being built by Riter & Conley, of Pittsburgh. One of the buildings will be 101 ft. long with a span of 26 ft.; the other building will be 184 ft. long and 54 ft. high with a span of 98 ft. Three 40-ton basic open-hearth furnaces are to be installed.

The Pencoyd Iron Works report large shipments of structural material to the Northern Pacific to be used in repairing and renewing bridges. It is said that 250 carloads have already been shipped.

The steel works of the Hainsworth Steel Co., at Pittsburgh, Pa., recently resumed operations in all departments, giving employment to about 400 men.

The rolling mill of the Lalance & Grosjean Manufacturing Co., at Harrisburg, Pa., started up recently after an idleness of 12 weeks, and will run on full time.

New Stations and Shops.

The Union Traction Company, of Rutherford, N. J., is to erect a new power-house and car barn, the Berlin Iron Bridge Co. having the contract. The buildings will be of brick, with steel framework, the roofs supported on steel trusses. The covering is to be corrugated iron throughout and the roof of the engine-house lined with the Berlin Company's anti-condensation fireproof roof lining.

Messrs. J. J. Walsh & Son, of Baltimore, who have the contract to build the new station for the Baltimore & Ohio at Clarksburg, W. Va., expect to complete the structure in six weeks. About $18,000 will be expended on the station and in building a new freight depot. The passenger station will be of brick, with stone trimmings and slate roof. It is to be 20 ft. × 100 ft. in size. A general waiting-room, ladies' waiting-room, smoking-room, ticket office and baggage and express quarters occupy this space. The location is about a mile above the present depot and is more convenient to the business section of the city. A large freightyard will be constructed adjacent to the new station.

The Bertrand-Thiel Open-Hearth Process.

At the Colorado meeting of the American Institute of Mining Engineers, a paper was read by Mr. Joseph Hartshorne, on the Bertrand-Thiel open-hearth steel process, which has now been in successful operation for more than two years, at the works of the Prager Eisenindustrie-Gesellschaft, at Kladno, in Bohemia. This process was devised jointly by Mr. Ernst Bertrand, General Superintendent, and Mr. Otto Thiel, Steel Superintendent of the Works. The objects were to increase the amount and improve the quality of the product per furnace, and at the same time, to reduce the amount of refractories and additions used; also to obtain a better control of the operations and of the product. Success has been obtained in all of these objects. There are two furnaces, of 12 and 20 tons respectively, the smaller standing at some distance behind and to one side of the larger and at a height of about 10 ft. above it. The furnaces are in the same building with the Bessemer converters. The process consists essentially in dividing the charge between the two furnaces, tapping the metal from the upper into the lower one, and skimming off the slag as it runs through a trough from one to the other. Both furnaces are basic, although this is not an essential feature of the process. Pig iron high in phosphorus and silicon is charged into the upper furnace with a small proportion of scrap, if desired, and also a certain quantity of ore and limestone. The remainder of the scrap is charged into the lower furnace, together with pig iron and a small quantity of limestone. A little ore is also added, if necessary. The lower furnace is charged about two hours later than the upper, and about three hours after charging the latter the transfer of the contents is made, all of the silicon being then contained in the slag, and the carbon and phosphorus to a certain extent eliminated. The slag is carefully skimmed from the metal as it passes down the trough and prevented from entering the secondary furnace. As soon as the two metals come together a very lively reaction ensues, which quiets down in about a quarter of an hour. The phosphorus is then below 0.03 per cent. in the bath. The heat is finished by the addition of ferro-manganese or spiegel, and the charge is then ready to be tapped, if no further improvement in quality be desired. Fifteen minutes longer in the furnace brings the phosphorus below 0.02 per cent. While the above may be called the standard practice, it may be greatly modified to suit special conditions of present existing plants, and the transfer of metal from one furnace to the other may be done by ladles in case the two furnaces are on the same level.

Steel Industry of Great Britain.

In the statistics of the production of steel in the United Kingdom during the first half of the current year, issued by the British Iron Trade Association, the total output of steel for that time is estimated as 1,969,320 tons, or at the rate of 3,938,640 tons per year. The greatest increase has been in open-hearth steel, of which 2,100,000 tons are now produced per year. During the first half of the year 966,014 tons of open-hearth were produced by the acid process and 97,784 tons by the basic. The acid process also greatly preponderates in the production of Bessemer steel.

A comparison of the total production of open-hearth and Bessemer steel from January to June inclusive, for 1896 and 1895, is as follows:

	1896, tons.	1895, tons.	Increase, tons.
Open hearth	1,063,798	887,800	175,998
Bessemer	905,552	801,860	103,662

These figures show how rapidly the production of open-hearth is supplanting that of Bessemer steel. This increase is still more marked when it is remembered that in 1887 the output of Bessemer was, at least, twice that of open-hearth steel.

The production of Bessemer steel rails during the first half of the present year was 449,924 tons, an increase of 137,610 tons over the 312,314 tons made last year.

The Chicago Elevated Loop.

In the cases brought by the abutting property owners asking for an injunction to restrain the Union Elevated Loop Company from constructing the loop in the downtown district, Chicago, the Supreme Court of Illinois has decided that as the right of way was given by the authority of the people, it was not within the province of an individual property owner to prevent the construction of the loop. If the adjoining property was damaged an ordinary damage suit could be brought in a court of common law. The work on the loop will now be proceeded with as rapidly as possible and will be completed by Jan. 1, 1897.

The New Lehigh Valley Passenger Engines.

In our issue of Oct. 9 appeared engravings and a description of the new wide-firebox engines built by the Baldwin Works for the Lehigh Valley. The errors are entirely due to careless proofreading.

The dimensions of the cylinders are given as 19 in. × 21 in. in one part of the description and as 19 in. × 26 in. in another part. The latter dimensions are correct.

It is stated that the grates are of steel. This should read "plates" (firebox).

The boiler is said to be of "the radial stay with firebox type." It should read "radial-stayed wide firebox."

The diameter of exhaust nozzle is given as 9 in. This should be 3½ in. How this remarkable dimension crept in we are at a loss to discover.

The New York and Brooklyn Bridge.

A board of engineers is to be appointed to consider and decide upon the feasibility of the plan for running the cars of the Brooklyn elevated and street railroad companies over the New York and Brooklyn Bridge to the New York side. This decision was reached at a meeting of the Bridge Trustees this week, the first meeting since July. The Mayors of Brooklyn and New York are each to select an engineer, and the President of the Bridge Trustees a third, who, with Mr. C. C. Martin, the Chief Engineer and Superintendent of the bridge, will form the Board of Engineers. Mr. L. L. Buck has been selected as one member of the board by the President of the Bridge Trustees, but the names of the others have not been announced as we go to press.

The trustees have also finally authorized the construction of a pneumatic mail tube on the bridge, connecting the New York and Brooklyn Post Offices. There will be two-inch tubes, each capable of carrying a cartridge made up of 500 letters every two minutes. The Government is to pay $14,000 a year for the service. The Reno Elevated Incline Co., received permission to build an experimental stairway on the New York side.

Air-Brake Litigation.

The hearing of the case of the Westinghouse Air-Brake Company against the Boyden Brake Company in the Supreme Court of the United States took place on Thursday and Friday of last week. The history of the case, which covers several years, is as follows: The case first came to hearing before Judge Morris in the United States Circuit Court for the District of Maryland. Judge Morris upheld the validity of the Westinghouse quick-action air-brake patent 360,670, and enjoined the Boyden Company under claim 2 of that patent, which he held to be infringed. He decided that claims 1 and 4, which were also in suit, were not infringed. An appeal was taken, and was heard by the Court of Appeals for the Fourth Circuit, sitting at Richmond. This court upheld the decision of Judge Morris as to the non-infringement of claims 1 and 4, and also held that claim 2 of the patent was defective in form and therefore invalid. This decision, therefore, dissolved the injunction granted by Judge Morris under claim 2 of the patent. As the validity of claim 2 of this patent was sustained in another suit by Judge Lacombe, and his decision confirmed by the Court of Appeals for the Second Circuit, the Supreme Court issued a writ of *certiorari*, ordering up the decision of the Court of Appeals for the Fourth Circuit in the Boyden case for review and final determination.

Hopper-Bottom Coal Cars.

The Central Railroad Co. of New Jersey is experimenting with different hopper-bottom devices on coal cars to determine upon a standard for future equipment. A number of cars have just been fitted up with the King, McMahon, Stone & Barney patent hoppers. Records will be kept of the time consumed in unloading these cars in all kinds of weather, together with cost for maintenance, etc.

The "Hawkins Process" in Birmingham.

A correspondent writes: "The Hawkins process of manufacturing basic open-hearth steel, at North Birmingham, Ala., experiments with which have been carried on for some time past, may be classed with those referred to, in Chapter XIV., in Mr. Metcalf's "Book on Steel"—humbug. The result has been the conversion of good, merchantable pig iron into a nondescript product, fit only for the scrap-heap. It is said that at least 20 pounds have been sold as a sample!"

The East River Tunnel Project.

The Railroad Committee of the Brooklyn Board of Aldermen has decided to report favorably on the application of the New York and Brooklyn Tunnel Co. for a franchise to construct a tunnel between the two cities.

THE SCRAP HEAP.

Notes.

Philadelphia papers state that the Union Traction Co., operating nearly all the street-car lines in that city, will, the coming winter, heat all its cars by electricity.

Pacific grain elevators A and B in Chicago, owned by the Chicago & Pacific Elevator Co., adjoining the track of the Chicago, Milwaukee & St. Paul, were burned down on Oct. 26. Loss $1,200,000.

A passenger train of the Chicago & Alton was stopped by robbers near Independence, Mo., on Oct. 23, and the express car robbed, but the messenger succeded in hiding most of his money in a chicken coop which was in the car, and it was not taken.

A New Steel Ferryboat for the Pennsylvania.

The new steel passenger ferryboat Pittsburg, launched at Cramp's shipyard last week, was built for the Pennsylvania Railroad Company, to ply between Jersey City and Twenty-third street, New York. It has twin screws on each end and two smokestacks. The dimensions are: Length over all, 206 ft.; length between rudder posts, 184 ft.; beam moulded, 46 ft.; over guards, 65 ft.; depth, from base line to top of deck beams, 16 ft.; average depth of hold, 15 ft. The hulls are of steel, with water tight compartments. Each vessel will be propelled by two three-cylinder compound engines, with cylinders 20, 32 and 32 in. in diameter by 24 in. stroke, each turning two propeller wheels on either end on a continuous shaft. These propeller wheels, four in number, will be 8 ft. 3 in. in diameter. Each engine is to develop 1,500 H. P. Steam will be generated by four water tube boilers, having a working pressure of 200 lbs. to the square inch. The St. Louis, a sister to the Pittsburg, will be launched in a short time.

Reclaiming Florida Lands.

The drainage of the Halpati Flats, now called the Cincinnatus Farms, an area of 312,000 acres, at the extreme headwaters of the St. John's River, opposite San Sebastian River, on the east coast, is progressing energetically. A railroad, about 12 miles long, has been constructed from the Florida East Coast Railway, at Sebastian, to the lands for transporting machinery and supplies, and the dredges will soon be set to work cutting the drainage canals. It has been estimated that this work, if completed on the original plan, will cost in the neighborhood of $1,000,000, and will reclaim 312,000 acres of rich saw-grass and prairie lands, now covered with water most of the year. The drainage will be to the eastward, into the San Sebastian River, an affluent of the Indian River. The original plans and estimates were made by J. F. Le Baron, Consulting Engineer, of Jacksonville, Fla. The work is now being done for Mr. A. O. Russell, of Cincinnati, O. Mr. A. O. Fries, County Surveyor of Brevard County, is Chief Engineer.

The New Calumet Park Transfer Yard.

The plans for the new yards of the Michigan Central, at Calumet Park, near Chicago, have been prepared. They will be used in connection with the Pennsylvania lines, the Chicago & Calumet Terminal, and the Chicago, Hammond & Western. The yards will extend from a point near the State line to Calumet Park, and will contain tracks for transferring freight from the various lines in and out of Chicago, and will relieve the existing congestion of business. Close traffic arrangements will be made with the Chicago, Hammond & Western. Work on the yards, the complete equipment of which will cost in the neighborhood of $500,000, will begin next week, and will be completed in 60 days.

The Maine Steamship Co.'s New Ship.

The new steamship John Englis, built for the Maine Steamship Co., was launched at Roach's shipyard, Chester, Pa., last week. The Englis will run on the line between New York and Portland. She is a steel steamer, 313 ft. 4 in. long; 290 ft. between perpendiculars, 46 ft. breadth of beam, and 17 ft. 6 in. depth of hold. Her displacement will be about 3,300 tons. She will be driven by a triple expansion engine, with cylinders 36, 48 and 75 in. in diameter, with a stroke of 46 in. and developing over 4,000 H. P. Her propeller is of cast open-hearth steel, 15 ft. 6 in. in diameter, and is expected to make about 94 revolutions a minute. The speed of the ship will be about 19 miles an hour. Steam will be supplied by six steel boilers, 12 ft. in length and 13 ft. 2 in. in diameter. The working steam pressure on the boilers will be 180 lbs. to the square inch. The total cost of the John Englis will approximate $400,000.

Wheat in India.

A despatch to the London *Times* from Simla, India, says that all of the railroads have reduced their rates for grain from the seaports to towns in upper and central India. No rain has fallen lately in the drought-stricken districts. Official reports indicate that up to the present the rural population of the Northwest Provinces and of Oudh are fully employed in the ordinary farming operations. The government has schemes ready for relief works when signs of distress appear.

Rate-Making.

[From an interview in the Atlanta *Journal* with Col. H. S. Haines, Commissioner of the Southern States Freight Association.]

Colonel Haines likens the rate situation of the United States to one of those beautiful geometrical spider webs which may be seen in the garden at sunrise. From the center outward the spider has stretched little radial lines like guy ropes. These he attaches at their outer ends to trees or shrubbery, and so the web is supported and steadied. Pull one of those little guy ropes and the whole fabric is thrown out of shape. The guy has a relation to all the other parts. So the rates are supported and stayed by influence connected with other rates all over the country. Change a rate and you pull wires unseen which will immediately make themselves felt at distances and in ways that would surprise the uninitiated.

"Rate making is not a science; it is an art. I cannot tell you why rates are so, and I have been in the business over 30 years. I attended a meeting to adjust rates in 1860, and was present at the organization of the Southern Railway & Steamship Association years ago. For years I was chairman of the rate committee of that association and its successors, and yet I cannot give you any general principle that would apply in all cases. Mention a particular rate and I can trace it back to its origin and tell you how it came to be fixed. Probably I should have to go back 20 years to get the whole story and show you all the influences that have made it. A rate is the result of a series of fights and contests between railways or between cities, or between commodities. There is a continual contest going on and a rate is a compromise between conflicting influences. When the compromise is reached, it is like peace established by treaty, and the roads are slow to upset it for fear of precipitating a costly conflict. If there is a change it must be by mutual agreement or there will be trouble. This association and others like it were organized to meet that difficulty.

"We have clerks whose duty it is to watch changes in other territory and see whether they affect business in our territory. The volume of our business may be imagined from the fact that our [correspondence] files run up to 29,000 in a single month. We receive a copy of the billing of every shipment from a competitive point in our territory, and these bills have to be inspected to see that the roads actually charge the tariff rates. We pass on 600,000 of these bills every month, and not long ago I had to go back through them for three years, a review of 21,600,000 bills! This work was done by 15 clerks in about two months. We have 60 men employed here. . . . The conflicting influences have a tendency to reduce rates. Of 460 changes between Oct. 21 and March 31, 386 were reductions.

"What do you think of the long and short haul principle of the interstate commerce law?" said the reporter.

"That is an attempt to eat the cake and keep it. It can't be done. It is like building up cities and pulling them down at the same time. It can't be applied in practice. If I undertook such a task I should go to a mad house in 30 days. The Supreme Court in the Social Circle case has decided nothing but that it is unlawful to take buggies and other goods from Cincinnati to Augusta for a lower rate than is charged on the same goods from Cincinnati to Social Circle. With a change of points or a change of articles, the circumstances change.

"Export rates fluctuate constantly, and we have to get them daily by wire. On one day they may be ten cents lower from Charleston than Savannah, and the next day it may be the reverse. It depends on the amount and kind of freight to be had at different points. A ship may have distress room and be willing to take any sort of freight to fill up, or it may have all it can carry and decline to take any more, while at the same time there is distress room at another port."

New York State Canal Improvements.

It is now decided that the Erie Canal will be made 9 ft. deep throughout, instead of in the prism alone, as at first contemplated. As this depth will also be obtained over all permanent structures, boats will be able to load to 8 ft. instead of 7 ft., as at first thought of. This improvement, together with those proposed in the locks and gates, will allow boats 115 ft. long to be used, thus making their carrying capacity about 60 per cent. greater than now. The greater part of the improvements on all the canals will be done while they are closed, so it is not expected to have all improvements finally completed before the opening of navigation in 1899. This gives about 15 months in all for work. The work requires the rebuilding of aqueducts, the new structures will be made of iron and steel. In the total 724 miles of navible waterways to be improved, there are 33 aqueducts, besides 261 locks and 1,100 bridges and other structures. With the $9,000,000 at the disposal of the state, it has been stated that three modern double-length steel lift locks could be built at Cohoes, Lockport and Little Falls; and that while it is not fully decided that a double-length steel lift lock could be built at Newark to take the place of the present three single locks, still it is hoped that the funds will permit of the latter construction also.

Of the $4,000,000 now available for this work, it is estimated that about $3,120,000 will be expended this winter, of which amount about $2,500,500 will be on the Erie Canal, $1,024,000 being on the Western division, $781,000 on the Middle and $745,000 on the Eastern. The work on the Oswego Canal will cost about $160,000 this season, and on the Champlain, about $410,000. Superintendent of Public Works C. W. Aldridge has invited bids on the work, as we specified last week. The work will require a total excavation of 3,261,000 cu. yds. of dry and wet earth, rock, etc.: 1,725,500 lbs. iron and steel; 6,475,000 ft. of lumber; 235,000 cu. yds. of concrete; 159,000 cu. yds. of channeling; 210,000 cu. yds. of embankment, besides lining, puddling, spikes and nails, piling, etc. There are 14 bridges to be raised and four wrecks to be removed.

Further bids for the improvements of the New York State canals were advertised on Oct. 27, as follows: On the Erie Canal, Middle Division, for the improvement of the canal from the east line of Oneida County to a point 100 ft. below the lower hollow quoin of lock No. 46; from a point 100 ft. below the hollow quoin of lock No. 49 to a point 100 ft. below the lower hollow quoin of lock No. 50; from a point 100 ft. west of the upper hollow quoin of lot No. 50 to 100 ft. west of the center of Camillus road bridge; from a point 100 ft. west of the center of Camillus road "113" to 100 ft. west of the center of Peru road bridge; from a point 100 ft. west of the center of Peru road bridge to 100 ft. west of the lower hollow quoin of lock No. 51, for improving lock No. 46 and work connected therewith; for improving lock No. 49 and work connected therewith; for improving lock No. 50 and work connected therewith. On the Oswego Canal, for building a stone apron to a portion of the Phoenix Dam and work connected therewith; for raising Braddock's dam and work connected therewith; for raising Minetto Dam and work connected therewith; for raising High Dam and work connected therewith; for raising the Oswego Dam and work connected therewith; for improving Lake Ontario level; for rebuilding and lengthening lock No. 18 at Oswego and for other work incident thereto.

Exports of Bicycles.

The exports of cycles from the port of New York for the fiscal year ending June 30, 1896, was in value $1,230,194, the value of the total exports from the United States, for the same time, being $1,898,000.

The Grand Trunk Elevator at Portland.

The contract for the erection of the superstructure of the new Grand Trunk elevator at Portland, Me., has been let to the Barnett & Record Co., of Minneapolis. The contract is to be completed by Feb. 1.

The Illinois Central Terminals at New Orleans.

The extensive new docks and port facilities of the Illinois Central Railroad, at New Orleans, were dedicated with imposing ceremonies on Wednesday of this week. Addresses were made by Governor Foster, Mayor Flower and President Stuyvesant Fish, of the Illinois Central.

Regulations for Opening the Harlem River Draw-Bridges.

The Engineer of the War Department, in charge of the Harlem River Improvements, New York City, has prepared regulations for the operation of the draws in the bridges across that river, to take effect Jan. 1 next. The new railroad bridge at Fourth avenue, 24 ft. above high water, is completed and will be put in use when the railroad company gets its approaches ready, and the new highway bridge at Third avenue, also 24 ft. above the water, is nearing completion. Under authority of the Federal laws of Sept. 19, 1890, and June 3, 1896, these regulations permit the bridge tenders to keep the bridges constantly closed except between 10 a. m. and 5 p. m.; and between those hours they are to be opened only for steam vessels. The tugs habitually using this river, that is, passing as often as once a day for ten days in a month, must have their pilot-houses, flag poles and smokestacks not over 24 ft. above the water line, so that they can conveniently pass underneath the draws, thus permitting them to be kept closed as much as possible. A vessel approaching a bridge (within the prescribed hours) and desiring to have it opened must give three blast of the whistle, to be answered by three blasts from the bridge if the way can be made clear. If the draw cannot then be opened the bridge man will give two blasts. When an express train is due within five minutes, boats may be required to wait. The vessels of the Government and of the New York Police must be allowed to pass without delay at any time, day or night.

The Æsthetics of Bridge Building.

On Wednesday of last week Mr. J. A. L. Waddell, M. Am. Soc. C. E., opened a series of non-resident lectures on Bridge Building at McGill University, Montreal. He took as his subject "Architectural Effect of Bridge Engineering." He said that the metal bridges built in the United States during the last two or three decades are, with rare exceptions, anything but models of excellence in respect to the principles of æsthetics. For this there are several reasons, of which the following are the principal ones:

1st. Very few technical schools in this country instruct their engineering students at all in architecture and not one of them gives to that important branch of constructive engineering the attention which it merits.

2d. As most American enterprises are consummated with a small amount of money compared with what might be spent advantageously in their materialization and completion, there are seldom any funds to employ in decorating the work.

3d. American engineers, as a rule, appear to regard with more or less contempt all efforts to engraft architectural ideas upon engineering construction. Moreover, in no branch of engineering are such violations so common and so pronounced as in that of bridge building.

4th. But the chief factor and the one which has had more influence than all the others combined, is the custom of letting bridges upon competitive designs and awarding the contract to the lowest bidder.

Mr. Lee Treadwell, Assoc. M. Am. Soc. C. E., lectured on "Foundations" and on the "Construction of the Sioux City Bridge."

Coal for the Navy.

According to the annual report of Commodore Chadwick, Chief of Naval Equipment, the warships last year burned 116,903 tons of coal, costing $620,131, and of this amount 61,741 tons were purchased abroad. Only 45 per cent. of this fuel was used for steaming purposes, the remainder being consumed for auxiliaries, including electric lighting, ventilation, etc. The flagship Philadelphia, which used only 764 tons in cruising, consumed 2,324 tons for auxiliaries. The Bureau, in endeavoring to utilize American coal as much as possible, has made a trial of placing a cargo of Pocahontas coal at Honolulu. This has been done at a rate which allows it to compete successfully with the Dominion of Canada coal, or that from Australia.

A Contract and its Lesson.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for an iron market-house at Guadalajara, Mex. If this market-house were built anywhere in the United States and paid for in our own money, the contract price would be $5,615. The Berlin Co. are, however, to receive in payment for this building Mexican silver dollars, and, therefore, their contract price with the City of Guadalajara is $11,230.

If Mr. Bryan and his Populistic platform should prevail and there should be free coinage of silver on the basis of 16 to 1, what is to prevent the Berlin Iron Bridge Co. from taking the dollars which they receive in payment on this building, each one of which contains more silver than the American dollar, to the United States Mint and, free of expense, having them coined into American silver dollars? They will then receive for their building 11,230 Bryan dollars, which he claims will be worth as much as gold dollars, consequently they can be used in paying the employees, thus leaving the company a clear profit of over $5,000 on this one contract. Or, again, they can take these same 11,230 standard silver dollars and with these pay the labor and expense of building another market-house, another bridge or building for the Mexican market, and receive for the same 22,460 Mexican dollars. They can then recoin these, free of expense, into American dollars, and thus by each transaction double their money. Does any laboring man in this country believe that labor paid for in money of that kind will have the purchasing power of our present dollar? Would there be any difference in paying labor in those dollars or in reducing the present rate of wages 50 per cent.? Who, under the circumstances, will be benefited by free coinage—capital or labor?

Spanish American Notes.

A bill was presented in the Congress of Colombia in September providing that railroad concessions should not in future be granted by that government to foreigners. This proposition is said to have been made on account of the troubles arising over the contract with Punchard, McTaggart, Lowther & Co., of London, for the construction of the Antioquia Railroad. The bill also provided for the cancellation of the concession to Mr. W. L. Cherry for the building of the Cauca Valley Railroad from Buenaventura, on the Pacific, to Cali and other points in the valley of the Cauca. This concession was owned by an American company, whose headquarters are in New York.

The recent discoveries of many rich gold veins in the provinces of Carabaya and Sandia, to the northeast of Lake Titicaca in Peru, some of which veins have already been sold for large sums to North American and European Corporations, have stimulated the promoters of railroad schemes in that republic, and a concession may soon be granted for a line either starting from Purio, the Lake Titicaca terminal of the Southern Railway or branching from that road some distance below Purio.

The improvement in traffic on the Peruvian railroads continues from month to month. The roads in operation controlled by the Peruvian corporation are: The Southern (448 miles), Central Transandine (160 miles), Trujillo (47½ miles), Pacasmayo (56½ miles), Paita to Piura (60½ miles). The gross income from these roads, aggregating 772½ miles, for the first half of the current year was 1,521,075 *soles*, the *sole* being worth about 48 cents. This was a gain of 359,990 *soles* over the receipts for the corresponding period of 1895.

A commission of Argentine and Bolivian engineers is to meet at Jujny, Argentina, this month to survey a route for a railroad to connect the existing systems in the two countries.

The corn crop in Argentina will be quite as short as the wheat crop, owing to the extremely wet season.

The government of Salvador is completing the railroad from Ateos to the capitol, San Salvador, under the direction of A. J. Scherzer, C. E. This gentleman built the prolongation of the Acajutla-Ateos line to Santa Ana, which was opened to traffic in July last.

The Sao Paulo (Brazilian) Railway Company proposes to increase its capital stock from £2,000,000 to £4,000,000, the object being to carry out the doubling of the track from Santos to Sao Paulo, as well as to provide other equipment and improvements which are needed. The Sao Paulo Railway is a broad gage (5 ft. 3 in. line, 86½ miles long.

The reported earnings for August were at the rate of $1,095 per mile per week.

The Engineers' Club of Rio de Janeiro has adopted a committee report condemning the proposed leasing by the government of the Central Railroad (formerly known as the Dom Pedro Segundo Railroad).

A Big Verdict.

In the Union County branch of the New Jersey Supreme Court, on Oct. 15, George M. Grant, of Jersey City, was awarded a verdict of $51,527.05 damages against the New York, Susquehanna & Western Railroad. The suit was to recover $100,000 for personal damages sustained on Jan. 31, 1895. Grant owned a lumber yard beside the railroad in Jersey City. He and his son started from the lumber-yard to walk across the railroad tracks in order to go home. They were run down by a passing locomotive. The son was killed outright, but Grant escaped with his life, but was badly injured.

Railroad Taxes in Illinois.

The Illinois State Board of Equalization has completed its work for this year and reports the valuation of railroad property as follows:

Number of corporations	105
Miles of main track	9,794
Valuation	$78,996,324

In addition to this the general statement of valuations included, under the head of railroad property, the following items, meaning, we suppose, property other than that used in connection with railroad business owned by railroad companies:

Personal	$688,751	$705,213
Lands	440,754	399,8'2
Lots	875,752	1,030,449
Total		$2,135,471

A Decauville Railroad in Quebec.

Mr. Menier, the owner of Anticosti Island, in the Gulf of St. Lawrence, intends building a railroad on the island, 126 miles long, which will extend almost its whole length. The road will be built on the Decauville system. The rails will be imported from France.

General Haupt on Compressed-Air Motors.

The Franklin Institute has invited General Herman Haupt, the President of the General Compressed Air Company, of New York, where his motors are now in operation, to deliver a lecture at the next monthly meeting of the Institute, to be held on Wednesday evening, Nov. 18, in Philadelphia. The paper will be comprehensive, covering history, economy and utility, with special reference to some of the details of the mechanism employed and the results of a long series of tests. These motors have been running regularly since Aug. 3 on the 125th street line, in New York.

Real Leaders of the Workingmen for Gold.

Mr. P. M. Arthur, Grand Chief of the Brotherhood of Engineers; Mr. F. P. Sargent, Grand Master of the Brotherhood of Locomotive Firemen, and Mr. F. W. Arnold, Grand Secretary and Treasurer of the Brotherhood of Locomotive Firemen, have felt it necessary to issue a circular letter addressed to the workingmen of the United States. This is sent out from Peoria under date of Oct 26. It appears that the silver men have posted and distributed what is called a proclamation, in which workingmen are informed that Messrs. Arthur, Sargent and Arnold are in favor of the free coinage of silver at the ratio of 16 to 1. In their letter they say:

"We wish to be recorded by all who are interested in our position as being emphatically and unequivocally against any such measure [free coinage of silver]; we are for the sound-money plank promulgated by the Republican Convention at St. Louis. . . . No matter what our opinions may have been on the money question at the time of our signing the memorial, nearly three years ago, we have learned enough since on the subject to warrant us in denouncing the attempt at free coinage of silver at 16 to 1, believing it to be directly against the interests of labor, and also believing that under a condition of free coinage this country will be subjected to one of the most frightful panics that any country in this world has ever seen. Our belief in this statement is strengthened by an admission made by William J. Bryan, candidate for President, in a recent speech in the Northwest, wherein he is reported to have said that he thought that a free-silver condition would bring, for the present, stagnation and panic, from which, in four years, we would recover."

A High Railroad Bridge.

A feature in connection with the new Prussian State Railroad, now being built between Remscheid and Solingen, will be a viaduct across the Upperthal, at the little town of Müngsten. This viaduct will have a total height of 167 m. (351 ft.), and the span of the center arch will be 170 m. (558 ft.) long. The cost of the structure is estimated at 2,500,000 marks ($595,000). For purposes of comparison, it may be noted that the Douro bridge at Oporto, in Portugal, the longest bridge now existing in Europe, has a span of 566 ft., with a rise of 146 ft.; the Garabit bridge, in France, has a span of 542 ft., with a rise of 170 ft.; the Washington bridge over the Harlem River, New York, has a span of 510 ft., with a rise of 91.7 ft.; the new steel arch now being built at Niagara, when completed, will have a span 840 ft. long, with a rise of 150 ft.

BRIDGE BUILDING.

Arlington, N. J.—The Erie has given the contract for a new bridge over the Passaic River, between West Arlington and North Newark, on its Greenwood Lake Division, to the New Jersey Steel and Iron Co., of Trenton. The bridge will be a double-track steel deck plate girder structure with four spans, each of 95 ft. 9 in. over all, and a draw of 147 ft. 4½ in. The bridge will be about 50 ft. above high water.

Baltimore, Md.—Both branches of councils have passed an ordinance authorizing the rebuilding of the bridge over Gwynn's Falls, on Wilkens avenue, at a cost of about $34,000.

Ben Avon, Pa.—The Pleasant Valley Traction Co. has had plans made for a viaduct 520 ft. long over Spruce Creek. The plans call for a cantilever span of 201 ft. or an arch 288 ft. with approach spans, roadway 18 ft., walks 8 ft. G. Kaufman, Consulting Engineer, Pittsburgh, Pa.

Burlington, Ia.—It is stated that contracts will soon be placed for the building of a new 166-ft. steel bridge to cross the river at this place.

Calais, Me.—The St. Croix & Penobscot has given the contract for an 85-ft. single-track steel girder bride over the St. Croix River, at Salmon Falls, to the Boston (Mass.) Bridge Works, at $3,000.

Flemington, N. J.—It is stated that the iron railroad bridge at Flemington Junction, known as Barton's Bridge, will be taken down at an early day and replaced by a more substantial structure. The new bridge will be several feet higher than the present one, necessitating considerable grading of the roadbed. Engineers are now making the necessary surveys.

Graham, N. C.—The Board of County Commissioners has ordered that a bridge be built across Haw Creek, between this place and Saxapahaw, for foot and vehicle travel; and S. H. Webb has been appointed to contract for the building of the same. The bridge will probably be of iron or iron and steel, with stone abutments.

Greensburg, Pa.—The court has approved the reports of viewers in the matter of building county bridges over Sewickley and Pocatos Creeks in Mt. Pleasant, Rostraver, Derry and Sewickley townships.

Hartford, Conn.—The city has let the contract for a stone arch bridge over the Park River at Asylum avenue to James J. Goodwin for $10,000. Mr. Goodwin will build an ornamental stone arch costing about $20,000 at this point, paying the balance of the cost himself in order to have an attractive-looking structure near his residence.

It is reported that the Broad street bridge has been condemned as unsafe, and the recommendation made that it be removed without delay and a new one built.

Marinette, Wis.—An iron bridge will be built between here and Menominee. The Marinette Council has met and accepted the compromise proposition of the Menominee Council, and plans and specifications will be drawn up and bids advertised for the construction of an iron bridge similar to that at the Marinette end.

Mountain View, N. J.—It is stated that the Morris County Board of Freeholders has annulled the contract of the Canton (O.) Bridge Co. for the two-span bridge over the Pequannock River at this place.

New York.—The new East River Bridge Commission has awarded the contract for the New York tower foundations of the bridge to Patrick H. Flynn, of Brooklyn, at his bid of $383,150. The facings of the foundations are to be of granite and the backings of limestone.

Ottawa, Ont.—Aid has been asked from the Dominion Government toward the proposed inter-provincial bridge, over the Ottawa River, from this place to Hull, Que. The city has given $150,000, the Ontario Government $50,000, Quebec Government is expected to give $50,000 and the Dominion is asked $250,000. The work will cost $500,000. The Premier has promised to comply with the request.

Perth Amboy, N. J.—At the next elections the voters of Middlesex County will decide the question of building a drawbridge over the Raritan River at this place.

Quebec, Que.—An error having been made in considering tenders for the construction of a bridge over the St. Charles River, the City Engineer has been authorized to invite new tenders for the work.

Riverfield, Que.—The contract for a 125-ft. iron bridge across the English River at this place has been let to the Imperial Bridge Co., Montreal, for $2,500.

Riverton, Va. The contract for replacing the span of the North River bridge at this place has been awarded to the Wrought Iron Bridge Co., of Canton, O., at $2,100.

Syracuse, N. Y.—The contract for a steel girder bridge over Onondaga Creek, at Cortlandt avenue, has been given to the Owego (N. Y.) Bridge Co., at $9,605. Other bids were: Groton Bridge & Mfg. Co., $10,233; Van Wagner & Hutchinson, Syracuse, N. Y., $10,604; Wrought Iron Bridge Co., Canton, O., $10,618.

Toledo, O.—The Lake Shore & Michigan Southern is building an arched bridge over Swan Creek. It will be of stone, and will replace an old wooden structure.

Victoria, B. C.—The Council has decided to proceed with the construction of the Point Ellice bridge, and a by-law to raise $150,000 has been passed by the Council. The City Engineer has been instructed to prepare plans and submit them to the Department of Public Works at Ottawa for approval. There will be three spans of 217 ft. each in length and 41 ft. in width. The cost will be in the neighborhood of $150,000.

West Braddock, Pa.—Capitalists interested in the Homestead & Highland Street Railroad have purchased the charter right to build the bridge over the river at this point. Work will be commenced at once. The Homestead & Highland will cross the structure.

Williamsport, Pa.—The Philadelphia & Reading is replacing its old wooden Howe trusses across the creek, four miles below here, with bridges of steel. Across the main stream there will be three truss spans of 114 ft. 6 in. for single track, and across the overflow channel there will be a deck plate girder bridge, 94 ft. long. The steel work is being done by the Phœnix Bridge Co.

They are also replacing their old Foreman truss bridge of three spans of 90 ft. each, across the the Lycoming Creek at the upper end of the city, by a deck plate girder one of six spans of 45 ft. each. The Pencoyd Bridge & Construction Co. has the contract for the plate girders.

York, Pa.—The grand jury has approved the veiwers' report on the proposed bridge over McCorkey's Run in Peach Bottom Township.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In New Hampshire it is held that the statute requiring railroad companies to provide stations and other facilities for the public is not repealed by the statute creating a Board of Railroad Commissioners; and a failure to keep a station open and warmed in inclement weather, at the hour advertised for the departure of trains, is a breach of its provisions.[1]

In Pennsylvania it is held that an insolvent railroad, which has not constructed its road, may resell to a creditor, in discharge of indebtedness, so as to prefer such creditor, rails bought to be used in constructing the road, and for which it has no present use.[2]

In the Federal Court it is ruled that where a railroad leases its line, without authority of law, though the lease is void, a servant of the lessee company, whose rights depend only upon contract, and not upon any public duty, cannot recover against the lessor company for injuries sustained through the negligence of the lessee in the operation of the road.[3]

In Maryland an agreement by a railroad, in consideration of the grant to it of the right to use water from certain land, that the owner of the land should be entitled forever thereafter to travel without charge upon the trains of the company, did not give him a right to free transportation over lines subsequently constructed or leased by it.[4]

Injuries to Passengers, Employees and Strangers.

In Ohio it is decided that the relation of carrier and passenger exists until the passenger has left the train by the usual route; and where a passenger left the train after the station was called out and the train had stopped and was thereafter injured before leaving the grounds by an engine which approached without warning, defendant was liable.[5]

In New York a railroad is liable to a passenger for his personal baggage, but not for merchandise, contained in his trunk, delivered to it by him, and accepted by it simply as passenger's baggage, and without notice to the company by the passenger that the trunk contained merchandise.[6]

In a case tried in Kentucky, plaintiff, a passenger from New Orleans to Junction City, Ky., bought a ticket from the railroad company's agent, with the agreement that he should have the right to go by way of Louisville. The ticket did not so provide, and at Lebanon Junction, where, as his ticket read, he should have changed cars, he was ejected from the train. The Supreme Court rules that he was entitled to recover the fare from Lebanon Junction to Louisville and return.[7]

In New York where baggage is checked through to any point upon a coupon ticket for a continuous passage over several connecting lines of railroad, and is delivered in a damaged condition, the owner may sue the company in whose custody he finds it damaged, and recover without proving that the company received it uninjured, the original good condition being presumed to continue.[8]

In New Hampshire it is said that whether or not the failure of a railroad to keep its station open was the proximate cause of an illness resulting to a passenger from exposure while standing on the platform, in inclement weather, waiting for a delayed train, is a question for the jury.[9]

In New Jersey it is held that the regulation of a railroad that a monthly commutation ticket shall be surrendered by the passenger to the conductor on the last trip taken during the period for which it is issued is a reasonable regulation of the railroad company in the conduct of its business as a common carier of passengers.[10]

In Minnesota the Supreme Court rules that there being evidence in an action by a passenger for damages for failing to exercise proper police powers to protect her, by reason of which a drunken fellow-passenger used toward her vile and abusive language, that the conductor failed to interfere after being notified of the passenger's misconduct, a finding that such powers were not exercised was warranted.[11]

In Texas a railroad is liable for injury to a passenger caused by negligence of the trainmen in putting her off in the night-time at a rough place, more dangerous than the crossing where passengers were usually put off, and where she supposed she was being put off, there being no depot in the neighborhood.[12]

In New Jersey it is decided that if, by any carelessness, inadvertence or casualty, the ticket of the passenger has been lost by him, so that he cannot produce it, the legal fare may be exacted from him; and the conductor is not bound to investigate the excuse of the passenger for its non-production, and determine whether it is made in good faith or not.[13]

In Texas in an action for personal injuries caused by a locomotive to an employee in the company's switch-yard, the fact that the locomotive was being operated within a city in a manner in violation of a city ordinance is prima facie evidence of negligence.[14]

In the same state where a servant is injured directly through the negligence of his master in furnishing his fellow-servants defective appliances, the master is liable, through the negligence of the fellow-servants in the use of the defective appliances may have contributed to the injuries.[15]

In Tennessee it is the duty of a corporation to enforce an observance of its rules governing employees, and it will be deemed to have waived such as are habitually violated with its knowledge and acquiescence.[16]

The Supreme Court of Texas rules that under the statute declaring all persons fellow-servants who are engaged in the common service of a railroad company, and are working together at the same time and place to a common purpose, of same grade, a hostler, whose duty it is to bring the engines into the roundhouse and take them out when necessary, and a boiler washer, whose duty it is to clean the boilers of the engines so as to fit them for further service—both being under the orders of the roundhouse foreman, and without authority over each other—are, as a matter of law, fellow-servants.[17]

In New York it is held that a trackman who stepped from the track on which he was working, in the course of his employment, to another, to avoid an engine, without looking down the second track, the view of which was unobstructed, when he could have taken a safer place, and was struck by an engine moving on the second track, in the same direction, and almost abreast of the first engine, is negligent, though the moving of trains in the same direction on parallel tracks was not customary on other portions of defendant's road and he was ignorant of a custom allowing it at the place of the injury.[18]

In Michigan in an action by an engineer against a railroad company for injuries by an explosion of the boiler of the engine, there was evidence that there were 50 or 60 broken bolts in the boiler, the ends of which were worn smooth; that the process of wearing them smooth required considerable time; that, in the inspection of boilers by the hammer test, 90 per cent. of all broken bolts could be discovered; and that the bolts break gradually. The Supreme Court holds that the evidence was not, as a matter of law, insufficient to prove that in an inspection by hammer test, made 14 days before the accident, defendant was negligent.[19]

In Texas defendant used the roundhouse of another company, and a servant of the latter was accustomed to bring defendant's engines out, when required. The court decides that while so engaged he was in the service of defendant and it was liable for his negligence in handling the engine.[20]

In Washington, where from 50 to 100 people daily, for four or five years, use a track for foot travel, with the acquiescence of the railroad company, such acquiescence creates a right, which imposes on the company a duty of ordinary diligence to avoid injury to persons so using the track.[21]

In Wisconsin plaintiff's intestate was killed by a collision with one of defendant's trains at a crossing, in the night time, while riding with two others in a buggy. Before reaching the crossing, they had driven a considerable distance parallel with the railroad, facing the approaching train, which could have been seen for 40 or 50 rods before it reached the crossing. The wind was also blowing from the direction of the train. The Supreme Court holds that deceased was chargeable with contributory negligence, whether or not the proper signals for the crossing were given by those in charge of the train.

In Michigan it is decided that where the thills became detached from a buggy upon one side, frightening the horse and preventing the buggy from being drawn straight, and, before the horse could be stopped, the buggy slid off the planks and struck the rail at a crossing, causing the occupant to be thrown from the buggy and injured, the railway company is not liable, as the fact that the planking between the rails did not conform to the statute relative thereto was not the proximate cause of the accident at the crossing.[23]

In Texas it is laid down that opening a train at a public crossing, when travelers are waiting to cross the track who would naturally suppose it was done to allow them to cross, and then closing it without giving them time to cross, shows negligence, whether signals were given or not.[24]

[1] Boothby v. G. T., 34 Atl. Rep., 157
[2] Johnson Co. v. Miller, 24 Atl. Rep., 316.
[3] Hukil v. M. & B. S., 72 Fed. Rep., 745.
[4] W. M. v. Lynch, 34 Atl. Rep., 40.
[5] P., C. & St. L. v. Martin, 2 Ohio. U. P., 353.
[6] Simpson v. N. Y., N. H. & H., 38 N. Y. S., 341.
[7] L. & N. v. Breckinridge, 34 S. W. Rep., 702.
[8] Fox v. Wabash, 38 N. Y. S., 88.
[9] Boothby v. G. T., 34 Atl. Rep., 157.
[10] Rogers v. A. C., 34 Atl. Rep., 11.
[11] Lucy v. C. G. W., 65 N. W. Rep., 944.
[12] H. & T. C. v. Smith, 33 S. W. Rep., 896.
[13] Rogers v. A. C., 34 Atl. Rep., 11.
[14] M., K. & T. v. McGlamory, 34 S. W. Rep., 359.
[15] Int. & G. N. v. Williams, 34 S. W. Rep., 161.
[16] L. & N. v. Reagan, 33 S. W. Rep., 1050.
[17] M., K. & T. v. Whitaker, 33 S. W. Rep., 716.
[18] Tomko v. Central, 37 N. Y. S., 144.
[19] Woods v. C. & G. T., 66 N. W. Rep., 328.
[20] M., K. & T. v. McGlamory, 34 S. W. Rep., 359.
[21] Roth v. Union Depot, 43 Pac. Rep., 641.
[22] Steinhofel v. C., M. & St. P., 65 N. W., 852.
[23] Murphy v. Mich. Cent., 65 N. W. Rep., 753.
[24] Fort Worth & D. C. v. Dennis, 33 S. W. Rep., 884.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Rome, Watertown & Ogdensburg, 1¼ per cent. on capital stock, payable Nov. 16.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama & Vicksburg, annual, Jackson, Miss., Nov. 2.
Baltimore & Ohio Southwestern, annual, Central Trust Co., New York, Nov. 19.
Buffalo, Rochester & Pittsburgh, annual, Union Trust Co., New York, Nov. 16.
Chicago Junction Railways and Union Stock-Yards Co., annual, Jersey City, Nov. 12.
Central of Georgia, annual, Savannah, Ga., Nov. 10.
Fall Brook, annual, Reading Center, N. Y., Nov. 11.
Lehigh Valley, annual, J. R. Fanshawe, Philadelphia, Pa., Nov. 17.
Manhattan, annual, Mercantile Trust Co., New York, Nov. 11.
New Orleans & Northwestern, annual, Secretary of company, Nov. 4.
New Orleans & Northeastern, annual, New Orleans, Nov. 4.
Raleigh & Gaston, annual, John H. Sharp, Treasurer, Portsmouth, Va., Nov. 12.
Richmond, Fredericksburgh & Potomac, annual, J. B. Winston, Secretary, Nov. 10.
Santa Fe, Prescott & Phœnix, annual, Prescott, Ariz., Nov. 18.
Savannah, Florida & Western, annual, Savannah, Ga., Nov. 24.
South Carolina & Georgia, annual, Continental Trust Co., New York, Nov. 11.
Spokane Falls & Northern, annual, Spokane, Wash., Nov. 9.
Wilmington & Weldon, annual, James F. Post, Wilmington, N. C., Nov. 18.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Society of Naval Architects and Marine Engineers* will hold its third general meeting at No. 12 West Thirty-first street, New York City, on Nov. 12-13.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

Canadian Society of Civil Engineers.

At the meeting on Oct. 22, Mr. J. A. Waddell, of Kansas City, Mo., delivered a lecture descriptive of bridges built and designed by himself. The lecture was illustrated by lantern slides.

The Civil Engineers' Club of Cleveland.

At the semi-monthly meeting, in the rooms in the Case Library Building, Tuesday evening, Oct. 27, Mr. Cecil L. Saunders read a paper entitled "Gas Producers and the Mechanical Handling of Fuel," presenting the subjects under the following heads: A discussion of various types—The necessity for attention to detail of construction—The relation of character of coal to type to be used—A possible field for future economy—Coal-handling from hoppers—Unloading coal by mechanical devices.

American Society of Civil Engineers.

The regular bi-weekly meeting of the American Society of Civil Engineers was held October 21, about 150 persons being present, 131 of whom were members. This was the largest bi-weekly meeting which has been held in the history of the society, and the consequent crowding of the meeting hall only served to show the urgent need for the new and larger quarters which have been so long projected. The paper of the evening, entitled "Suspension Bridges, a Study," which had previously appeared in the September *Proceedings*, was presented by Mr. George S. Morison. The paper was discussed at some length by Mr. Theodore Cooper, also by Messrs. E. G Spilsbury, Francis Collingwood, W. H. Burr, Joseph Mayer, H. S. Prichard and W. H. Breithaupt. Written discussions were read by the Secretary from L. F. G. Bouscaren and T. C. Clarke.

Engineers' Club of St. Louis.

The club met Oct. 21, Vice-President Flad in the chair, 23 members and 4 visitors present. Mr. William H. Bryan read a paper on "Boiler Efficiency, Capacity and Smokelessness with Low-Grade Fuel." The discussion now going on among the mechanical engineers of this country regarding the best method of expressing the economic performance of boilers was explained, and the revision of the generally accepted code for making boiler trials shown to be necessary. The author strongly advocated the statement of boiler efficiency in the percentage realized of the calorific value of the fuel, taking care that the coal used be carefully sampled, and its calorific power determined by the most accurate means possible. The writer presented a table giving the results of a large number of trials he had made to determine the efficiency and smokelessness of various types of boilers, with and without improved settings. The table gave the maximum, minimum and average results secured. The paper was accompanied also by a table of fuel analysis and calorific determinations covering all the common Southern Illinois coals coming to this market. Discussion followed by Messrs. Russell, Kinealy, Flad, Moore, Wheeler, Leighton, Ashburner, Harrington and Wm. T. Bonner, of Cincinnati.

Society of Western Engineers.

On Thursday evening, Oct. 15, a party consisting of 175 members of the Western Society of Engineers left Chicago by special train over the Louisville, New Albany & Chicago, arriving at Bloomington, Ind., Friday morning. The day was spent in visiting the various stone quarries at this place, the society being entertained by the representatives of the various stone companies and taken by train over the Belt road to points of interest. Louisville, Ky., was reached Friday evening, at which place the society were the guests of the Western Cement Co. Early Saturday morning a special train was taken to the quarries and mills of the Western Cement Co. and the J. B. Speed Cement Works. The return was made over the new Jeffersonville & Louisville bridge, the train stopping so that an examination of the structure could be made. The party was then taken by steamboat to the City Water-Works plant, recently completed, where some interesting tests of the various methods for filtering water are being made. The party arrived in Chicago Sunday morning.

The regular meeting of the Society of Western Engineers was held last week in the rooms of the Society, No. 1736 Monadnock Building. A paper on "Railway Yards and Terminals" was read by H. G. Hetzler, Among those taking part in the discussion were T. L. Johnson, Alfred Noble, Isham Randolph, Professor Whitney, of Madison University, and L. H. Evans. The next meeting will be held Nov. 4. A paper on "Medical Treatment of Men on Engineering Work" will be read by Dr. S. W. Maphis. Nov. 6 and 7 the Society will make an excursion to Rock Island and Davenport to inspect the government arsenal and the new government bridge across the Mississippi.

Engineers' Society of Western Pennsylvania.

At the meeting held on Sept. 20, 1896, Mr. Gustave Kaufman read a paper on "Hydraulic Power Transmission." After a brief history of the art of distributing hydraulic power from central stations to many consumers in cities in England, a short description of the plant of the London Hydraulic Power Co. was given. Formulæ were given showing the method of calculating the amount of power in any given quantity of high-pressure water. The purpose of the paper was to show the application of a hydraulic system to the uses of Pittsburgh, claiming that with this system a relief from the smoke nuisance could be obtained. A description of a plant suitable for the present requirements of Pittsburgh was given in detail.

The pressure at which the water was to be distributed was assumed at 750 lbs. per square inch. The plant could deliver about 400 H. P. continuously. There would be two accumulators, each 18 in. in diameter, with 21 ft. stroke. Distributing mains, each 6 in. in diameter. The distributing system would embrace the entire business part of the city. The estimated cost of the pumping station is $100,000; distributing system, $102,600; engineering and contingencies, $27,400; total, $230,000. The annual cost of operating, including interest on cost of plant, to be $42,000. The machinery to which the hydraulic power could be successfully applied was stated to be: Hydraulic elevators, cranes, hydraulic intensifiers, fire hydrants, hydraulic engines. It is claimed in the paper that it would be cheaper for consumers to use high-pressure water at the rates charged by the London Hydraulic Power Co. than at those they pay at present. Individual steam plants in the various buildings could by means of such a system be done away with and in that way reduce the amount of smoke now polluting the atmosphere of Pittsburgh.

Society of Naval Architects and Marine Engineers.

The fourth general meeting of the Society of Naval Architects and Marine Engineers will take place in New York City, at 10 a. m., Thursday, Nov. 12, 1896. Through the courtesy of the President and Managers of the American Society of Mechanical Engineers, the meetings will be held in the auditorium of No. 12 West Thirty-first street, the sessions continuing through Thursday and Friday, Nov. 12 and 13.

There will be a banquet at Delmonico's, at 7 p. m., Friday, Nov. 13, at which Secretary Herbert will be the guest of the society.

Following is a list of papers to be read at the meeting:

Thursday.

Test of an Experimental Turret of the United States Battleship Massachusetts, by Commodore W. T. Sampson, U. S. N., Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Steel Canal Boats, by Lewis Nixon, Manager Crescent Shipyard, Elizabeth, N. J.

Trial Performance of the Grand Duchess, by Sommers N. Smith, Manager Newport News Shipbuilding and Drydock Company, Newport News, Va.

Naval Practice in Ship Rivets and Riveting, by Naval Constructor J. H. Linnard, U. S. N.

American Fireboats, by H. DeB. Parsons, Marine Engineer.

Corn-Pith Cellulose, by Henry W. Cramp, Vice-President, Wm. Cramp & Sons, Philadelphia, Pa.

Friday.

The New Battleships, by Chief Constructor Philip Hichborn, U. S. Navy.

Speed Trials of a Screw-propelled Ferryboat, by F. L. DuBosque, Engineer Floating Equipment, Pennsylvania Railroad.

Hydraulic Sheers for Lifting One Hundred and Twenty-five tons, by Frank B. King, Marine Engineer and Naval Architect.

A Method of Calculating the Stability of Ships, Adapted to the Use of Standard Curves of Stability, by Hugo Hammar, Naval Architect.

Stability of a Ship in Damaged Condition, by James Swan, Massachusetts Institute of Technology.

Damaged Conditions as Affecting the Stability and Fighting Efficiency of Battleships, by Assistant Naval Constructor T. F. Ruhm, U. S. Navy.

Screw Propellers, by Professor Geo. R. McDermott, Cornell University, Ithaca, N. Y.

PERSONAL.

—Mr. Edward Sands has been appointed New England Freight and Passenger Agent of the Plant Lines, with headquarters at Boston, to succeed Mr. A. P. Lane.

—Mr. William Duncan, formerly second Vice-President and Traffic Manager of the Baltimore & Ohio Southwestern, has been elected President of the St. Louis Cotton Compress Co.

—Mr Frank Julian, formerly connected with the testing department of the Illinois Steel Company, has been appointed Chief Chemist of the Great Northern in place of Mr. P. H. Conradson, resigned.

—Mr. J. Harris Sommerville, of Canajoharie, N. Y., Assistant Road Master of the Mohawk Division of the West Shore road, was instantly killed near Little Falls, N. Y., this week by an express train.

—Mr. O. W. Beckwith, at present Chief Train-Dispatcher of the Chicago division of the Cleveland, Cincinnati, Chicago & St. Louis, at Kankakee, has been appointed Train Master on the Cincinnati Division.

—John G. Pinkerton, Master of Transportation of the Kansas City, Memphis & Birmingham Railroad, was killed at Sulligent, Ala., last week by slipping from the steps of a car while attempting to board the train.

—Mr. P. Ryan has been appointed Superintendent of the Montana division of the Great Northern, vice Mr. W. Hale, resigned, and will continue in charge of the Kalispel division. Mr. J. P. Rogers has been appointed Assistant Superintendent of the Kalispell division.

—Mr. Lefferts L. Buck, Chief Engineer of the new East River bridge between New York and Brooklyn, has been appointed one of the three experts who are to report on the feasibility of running elevated trains over the present bridge. Two other experts are to be appointed by Mayors Strong and Wurster.

—Mr. D. F. Maroney has been appointed Superintendent of Transportation of the Baltimore & Ohio road. He is at present chief of the car-record service of the company, and the duties of this office will be consolidated with those of his new position. General Superintendent Fitzgerald has heretofore looked after the work which Mr. Maroney will now have charge of.

—Mr. William Hainsworth, formerly head of the Hainsworth Steel Co., of Pittsburgh, now controlled by the Oliver interests, died at his home at West Seattle, Wash., Oct. 12, of apoplexy. Mr. Hainsworth was born in Leeds, Yorkshire, England, in 1833, but lived almost his entire life in the United States, principally in Pittsburgh. Since 1889 Mr. Hainsworth had been located in Washington, and had built an iron and steel mill at Ballard in that state.

—Mr. Horace Tucker has been elected Chairman of the Chicago and St. Louis Traffic Association and has assumed the duties of that position, with headquarters in the Chicago, Burlington & Quincy Building, corner of Adams and Franklin streets, Chicago. The Illinois Rate Committee will probably make Mr. Tucker its Chairman as well, with increased territory. Mr. Tucker was recently Traffic Manager of the Chicago, Hammond & Western, and for many years was General Freight Agent of the Illinois Central.

—Mr. Wallace W. Atterbury has been appointed Superintendent of Motive Power of the Pennsylvania Railroad Division to succeed Mr. J. M. Wallis. Mr. Atterbury, who has been Master Mechanic of the Western Division of the Pennsylvania Company, located at Fort Wayne, Ind., was born Jan. 31, 1866, at New Albany, Ind. He is a graduate of Yale University and entered the railroad service in 1886 as an apprentice in the Altoona shops of the Pennsylvania, since which time he has been consecutively, 1889 to 1892, Assistant Road Foreman on various divisions of the same road; 1892 to 1893, Assistant Engineer of Motive Power, Pennsylvania lines, northwest system; 1893 to date, Master Mechanic Pennsylvania Company at Fort Wayne, Ind.

—Mr. John H. Drake, of Middletown, N. Y., President of the Drake & Stratton Company, contractors, with offices in New York, Philadelphia and Pittsburgh, died in Philadelphia last week. With Mr. W. D. Stratton, who was his brother-in-law, he formed the contracting firm of Drake & Stratton in the seventies. In 1891 they formed the Drake & Stratton Company, Limited, and in 1894 the present company was incorporated. The firm carried out some of the largest masonry bridge work and railroad construction contracts, and the business grew to great proportions. It is now engaged upon work for the Baltimore & Ohio, the Pennsylvania, and the Erie roads, and for the city of Pittsburgh, and it also has the contract for the new New York reservoir.

—Mr. John M. Wallis has been appointed General Superintendent of the Philadelphia & Erie and Northern Central roads, to succeed the late Mr. Robert Neilson. Mr. Wallis, who has been Superintendent of Motive Power of the Pennsyivania Railread Division, Pennsylvania Railroad, at Altoona, Pa., was born Dec. 10, 1853, at New Orleans, La., and is a graduate of the Stevens Institute of Technology. He entered the railroad service in 1877 as an apprentice in the Baltimore shops of the Northern Central, since which time he has been consecutively: November, 1879, to December, 1881, Assistant Road Foreman of Engines Northern Central, and Baltimore & Potomac, December, 1881, to June, 1882, Assistant Engineer of Tests, Pennsylvania Railroad, at Altoona, Pa.; June, 1882, to June, 1883, Superintendent of Motive Power, Northern Central Railway; June, 1883, to June, 1890, Superintendent of Motive Power, Philadelphia, Wilmington & Baltimore; June, 1890, to date, Superintendent of Motive Power, Pennsylvania Railroad Division.

—Mr. James Henry Greathead died last week at about the age of 50, and those who knew him or knew his work well will realize that his death is a serious loss to the world. Mr. Greathead was a student of Brunel, and while in Brunel's office he acquired a practical experience in tunnel engineering, which doubtless had a great influence in turning his work in the direction which within a few years has made him famous. He was the Chief Engineer of the underground electric railroad first known as the City of London & Southwark and now as the City & South London, which work embodied so novel a combination of ideas in construction and operation as perhaps to warrant calling it a "system." At any rate, that particular method of building and working a railroad is now popularly known, and probably will long be known, as the Greathead system. The readers of the *Railroad Gazette* do not need to be told what this system is. The City & South London Railway runs in two deep tunnels which were driven by the circular shield system and which are lined with cast-iron cylindrical segments, a system which has become well-known in recent years by several examples, a famous one of which is the Grand Trunk tunnel between Sarnia and Port Huron. The City & South London tunnels reach a considerable depth below the surface, and passengers are carried between the rail level and the street level by great hydraulic lifts, the maximum height lifted being 55 ft. 3 in. The trains are worked by electricity, the electric current being carried by the third rail system. The mechanical success of this work at once made Mr. Greathead's name widely and favorably known, and his services have since then been in great demand for the study of city railroad projects. He was made the Engineer of the Liverpool Overhead Railway, and at the time of his death was associated with Sir John Fowler and Sir Benjamin Baker as Engineers of the new Central London Railway, now in construction between Liverpool street and Shepherd's Bush, a distance of 6½ miles. He was called in consultation by the engineers and promoters of city railroads in many countries and was also Consulting Engineer with Sir Benjamin Baker for the Hudson River Tunnel Company in the last effort made to complete that unfortunate work.

Mr. Greathead was a man of uncommon ability as an engineer, and while he had considerable originality he had also great calmness and poise of character. He was deliberate in his opinions and deliberate in his expression of them, and the result was that he commanded confidence, as he deserved to. He was also a painstaking student, and constantly acquired knowledge as he went on, and had became a useful and eminent member of his profession with prospects of far greater usefulness before him. He was elected a member of the Institution of Civil Engineers (British) April 5, 1881, and was a Member of Council.

ELECTIONS AND APPOINTMENTS

Chesapeake & Ohio.—The annual meeting of the company was held at Richmond, Va., last week. The old Board of Directors was re-elected unanimously as follows W. P. Anderson, Rhode Island; Henry T. Wickham, Decatur Axtell, Richmond; George T. Bliss, Samuel Spencer, C. H. Coster, Chauncey M. Depew, C. D. Dickey, of New York; M. E. Ingalls, Cincinnati, O.

Chicago Great Western.—The directors have re-elected the following officers: President, A. B. Stickney; Vice-Presidents, A. Oppenheim, C. W. Benson and A. Kalman; Secretary, R. C. Wright; Treasurer, Charles O. Kalman; Vice-President and Auditor, W. B. Bend; General Manager, S. C. Stickney.

Cleveland Terminal & Valley.—Directors were elected at the stockholders' meeting in Cleveland last week, as follows: Thomas M. King, Alexander Shaw, Wm. H. Blackford, J. H. McBride, George A. Garretson, S. T. Everett, L. V. Backins, F. H. Goff and James Bartol. This company is operated in connection with the Baltimore & Ohio, which enters Cleveland over its tracks. Officers were chosen as follows: Thomas M. King, President; S. T. Everett, Vice-President; James Bartol, Secretary and Auditor; F. E. Rittman, Treasurer. The financial reports showed the total earnings to have been $559,-809, the expenses $23,953 and the net earnings $188,436.

Denver & Rio Grande.—The annual meeting of the stockholders was held at Denver, Col., Oct. 21, about 80 per cent. of the stock being represented. The former Board of Directors was re-elected as follows: George Coppell, Richard I. Wilson, William Martens, Charles G. Peaman, J. Edward Simmons and Arthur Coppell, of New York City; John Lowber Welsh, of Philadelphia; Edward I. Jeffrey and Edward G. Wolcott, of Denver.

Evansville & Terre Haute.—The annual meeting of the stockholders was held at Evansville last week, and the following were elected directors: W. H. Tilford, E. N. Gibbs, J. L. Lampson, John Hone, H. M. Tilford, John W. Sterling, W. H. Goadby, all of New York; Henry Sanger Snow, of Brooklyn, and H. B. Barlow, of Evansville, Ind.

Georgia, Southwestern & Florida.—The following directors were elected at the stockholders' meeting at Macon, Ga., Oct. 22: Samuel Spencer, William Checkley Shaw, Skipworth Wilmer, Thomas B. Gresham, H. P. Smart, George W. Parrott, A. S. Pendleton, W. A. Merriday, W. O. Taft, J. F. Hanson, Morris Happ, T. D. Tinsley, J. M. Johnson, R. M. Rogers, F. M. Edwards. Messrs. A. B. Andrews and Ben C. Smith tendered their resignations as members of the board.

Great Northern.—The headquarters of T. E. Adams, Superintendent of the Dakota Division, have been transferred from Grand Forks to Larimore, N. Dak.

Illinois Central.—At the annual meeting of the stockholders at Chicago, Oct. 21, S. Van Rensselaer Cruger, Charles A. Peabody, Jr., and John C. Welling were re-elected directors.

Indiana, Decatur & Western.—At the annual meeting, M. D. Woodford, President of the Cincinnati, Hamilton & Dayton; M. M. Shoemaker and A. Taylor were re-elected, as was the old board.

Maine Central.—At the annual meeting of the stockholders, Oct. 21, the directors were re-elected, except F. W. Hill, of Exeter, who declined and was succeeded by Joseph H. Manley, of Augusta, Me.

Marietta & North Georgia.—The new company is expected to come into possession of the property Nov. 1. The new Board of Directors will be J. B. Glover, the former Receiver; J. J. Spalding, of Atlanta, of general counsel for the company; McWilliams, General Manager, and B. A. Denmark, of Savannah; President McHarg, of the new company, Gen. Horace Porter and Mr. Walter Ferguson; all of New York.

Nashville & Decatur.—The stockholders met at Nashville, Tenn., Oct. 21, and elected the following directors: D. B. Cliffe, T. S. Weaver, J. H. Thompson, Byrd Douglass, W. W. Berry, A. W. Harris, W. A. Goodwyn, John Orr, John Overton, W. E. Winstead, W. R. Pryor, J. E. Washington, G. E. Washington, H. A. Tyler and Milton H. Smith. The directors re-elected D. B. Cliffe, of Franklin, Tenn., President and Samuel Seay Secretary.

New England.—The second annual meeting of the new company was held at Hartford, Conn., Oct. 22. The following directors were elected: William F. Hart, Boston; Francis L. Higginson, Boston; N. W. Rice, Boston; Charler L. Lovering, Boston; Jesse Metcalf, Providence; Gorham P. Pomroy, Providence; Frederick J. Kingsbury, Waterbury; D. S. Plume, Waterbury. Charles P. Clark, New Haven; Robert Bacon, New York; John W. Doane, Chicago.

New York, New Haven & Hartford.—The election of directors at New Haven, on Oct. 21, resulted in the selection of William D. Bishop, Henry C. Robinson, Charles P. Clark, Joseph Park, Chauncey M. Depew, Henry S. Lee, William Rockefeller, Leverett Brainard, J. Pierpont Morgan, George MacCulloch Miller, John M. Hall, Charles F. Cnoate, Nathaniel Thayer, Royal C. Taft, Charles F. Brooker, Charles French, George J. Brush, I. Dever Warner and Arthur D. Osborne.

Northern Pacific.—At the first meeting of the newly elected Board of Directors, held in New York, Oct. 26, for the purpose of organization, the following officers were elected: Chairman of the Board of Directors, Edward D. Adams, New York; President, Edwin W. Winter, St. Paul; Vice-President, George C. Gorham, Washington, D. C.; Controller, John Scott, St. Paul; Secretary, Charles F. Coaney, New York; Assistant Secretary, George H. Earl, St. Paul; Treasurer, Albert E. Little, New York; Assistant Treasurer, C. A. Clark, St. Paul. The Board of Directors, elected at the recent meeting of the stockholders, is composed as follows: Edward D. Adams, C. H. Coster, Charlemagne Tower, Jr., Robert M. Gallaway, Eben B. Thomas, Robert Bacon, D. Willis James, Edwin W. Winter, Francis Lynde Stetson, Samuel Spencer, Dumont Clarke, Brayton Ives, James Stillman and Walter G. Oakman.

Pennsylvania.—J. M. Wallis, of Altoona, Superintendent of Motive Power of the Pennsylvania Railroad Division, has been promoted to be General Superintendent of the Philadelphia & Erie and the Northern Central, with headquarters in Williamsport, Pa., to succeed the late Robert Neilson.

Pittsburgh & Brownsville.—The directors of this new company in Pennsylvania are G. S. Davison, Pittsburgh, President, and Leonard G. Hoel and Charles W. Davison, of Pittsburgh; William G. Wilkins and Joseph H. Kuntz, of Allegheny; Florian G. Ross, of Dunkirk, and James R. Elliott, of Braddock, Pa.

Pittsburgh & Western.—The annual meeting was held in Allegheny last week and the following officers were elected: Thomas M. King, President; General Orland Smith, Vice-President; W. H. Daffell, Treasurer; I. J. Crump, Secretary: A. M. Byers, General C. L. Fitzhugh, Henry W. Oliver, John McCleave, Orlando Smith, James Sloan, Jr., and Aubrey Pearre, directors.

Pittsburgh Junction.—The following are the directors for the ensuing year: President, Thomas M. King; Vice-President, C. L. Fitzhugh; directors, John W. Chalfant, J. Painter, Jr., John Z. Speer, C. H. Spang, Reuben Miller, Alex. Bradley, H. W. Oliver, Wm. Metcalf, A. E. W. Painter, C. L. Fitzhugh, of Pittsburgh, and Chas. E. Mayer and William F. Frick, of Baltimore; Secretary and Auditor, James A. Smith; Treasurer, Robert Wardrop; Superintendent, Robert Finney, Jr.

Western Maryland.—At the annual stockholders' meeting last week, Directors were elected as follows: William Kealhofer and John W. Cable, of Washington County; Granville S. Haines, of Carroll County; Charles W. Slagle and Thomas J. Shryock, of Baltimore City. The city's interest in the property is represented by eight Directors, who are yet to be named by the Mayor

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Central of New Jersey.—The extension of the road, which will give the company connection with the Erie & Wyoming Valley road and entrance to Pittston, Pa., will soon be completed. The principal object in its construction is to secure more economical transportation of coal, and it is not likely that any passenger trains will be run on the new line. There is considerable interchange of freight with the Pennsylvania, which is now subject to a trackage charge on the Lehigh Valley, which will be saved when the new line is in operation.

Chamela, Guadalajara & San Luis Potosi.—Arrangements have been completed for the construction of the first section of this road in Mexico. The plan from Guadalajara to Chamela, the Pacific Coast terminus of the road, a distance of about 400 km. have been submitted to and approved by the Mexican authorities. The plans from Guadalajara to San Luis Potosi, about 300 km., are now being made, under the direction of Engineer Corona, of Guadalajara. It is expected to begin active work in December at Guadalajara on the Mexican Central.

Denver, South Park & Hill Top.—Judge Hallett, of the United States Court, at Denver, last week, issued an order, on petition of Frank Trumbull, Receiver of the Denver, Leadville & Gunnison, permitting the road to assist in the construction of this line from Fairplay to the Hill Top mines, by the use of second-hand rails, and also allowing the road to enter into a traffic agreement with the new road to furnish the rolling stock therefor. The Receiver is authorized to receive stock and bonds of the new road in payment.

Florence & Cripple Creek.—The grading of the new roadbed from Victor, Col., to Goldfields has been completed and arrangements are being made to give Orman & Co. the contract for extending the line around Bull Hill to Altman, and from thence to all of the mines of the district.

George S. Baxter Co.—This firm, manufacturers of crossties, Waycross, Ga., owning 55,000 acres of yellow pine timber southeast of Dupont, is building a railroad from the nearest point on the Plant lines to the main body of timber. The road is to be 25 miles long. Over 500 men will be employed by the company. Large contracts for crossties have been made with the New York Central and the Plant system, the shipments to the north being made through Savannah.

Macon, Dublin & Savannah.—The officers have evidently decided not to build to Savannah, Ga., for the present at least, thereby abandoning the valuable franchise and privileges granted it there and for which it has paid $5,000 into the city treasury.

New Roads.—Charles H. Burns, of Bridgeport, Conn.; Hall & Grey and F. S. Whitehouse, of Lincoln, N. H., owners and operators in the Pemigewasset Valley, in New Hampshire, have started active operations on a road through that valley, north from North Woodstock, on the Boston & Maine. The road is to be used at first only to transport lumber and other freights.

Perry, Livingstone & Wyoming.—This company has been incorporated in New York to construct a standard gage road about 12½ miles in length, from a point on the Silver Lake Railway, in Perry, Wyoming County, thence to a point on the Delaware, Lackawanna & Western at Greigsville, Livingstone County. The capital is $125,000, and the directors are Arthur C. Yates, Fred W. Yates, George E. Merchant, John F. Dinkey, George H. Clune, George L. Eaton, Robert W. Davis, of Rochester; Harry Yates, of Buffalo, and William D. Page, of Perry, N. Y.

Pittsburgh & Brownsville.—This company has been organized in Pennsylvania to build a road from Brownsville, Fayette County, Pa., to a point at or near McClellandtown, in German township, in Fayette County. The length of road will be about 15 miles. The capital stock is to be $150,000. George S. Davison, of Pittsburgh, is President.

Portland & Mumford Falls.—The work of laying the rails on the branch which the company is building from Canton to Otis Falls, Me., has been begun. The line will open up a new timber region, and reach important mills.

Quakertown & Eastern.—The quo warranto proceedings instituted Oct. 12 against the company, which has just been organized, to annul its charter came up last week before the Attorney-General of Pennsylvania, who dismissed the matter, the charges of non-compliance with the law against the company not being sustained. Work on the new road from Quakertown to Riegelsville in Eastern Pennsylvania, near the Delaware Water Gap, will now be rapidly pushed before winter sets in. The new road could be used advantageously by the Lehigh & Hudson and the Delaware, Lackawanna & Western to reach Philadelphia.

Queen Anne's.—An amicable arrangement has been effected with the Pennsylvania Railroad in regard to the proposed crossing of the latter at Greenwood and Ellendale, Del. This arrangement relieves the Queen Anne's road from delay in building the remaining 25 miles of line to reach the ocean at Lewis, Del. The contract will soon be awarded for this work, and it is planned to have the whole line from Queenstown to Lewis ready for operation by April 1, 1897. W. H. Bosley, of Baltimore, is President.

Wisconsin & Michigan.—A branch of about five miles is likely to be built from either Fisher or Kell, to the site of a proposed pulp mill at White Rapids.

Electric Railroad Construction.

Baltimore, Md.—D. E. Evans & Co., of Baltimore, has received the contract to build the extension of the tracks of the Central Railway Co. on Wolfe and other streets in East Baltimore. The bid exceeded $100,000. Work will begin at once on the extension of six miles of double track. The feed wires of one line will be placed underground in conduits.

Bangor, Me.—Work will begin at once on the construction of an electric road from Bangor to Winterport, a project which has been considered for a year or more. The road may eventually run to Kenduskeag and East Corinth, making a road 40 miles long.

Brooklyn, N. Y.—The extension of the line of the Brooklyn Heights electric road to Flushing was opened for regular traffic Sunday, Oct. 25. The entire branch known as the Flushing extension is 10½ miles long from the City Hall, Brooklyn, the cars running via Myrtle, Washington, Park and Flushing avenues. The line has been in operation as far as Corona, 3½ miles from Flushing, for some time past. An account of the formal opening, which occurred on Saturday, is given in another column.

Buffalo, N. Y.—On Oct. 9, the Council granted to the Crosstown Street Railway Co. a franchise for constructing an extension of a mile to its road in Clinton street. The company has 30 days in which to sign the grant.

Charleston, S. C.—President Passailaigue, of the Enterprise Street Railway Co., says that work will begin in 30 days on the extension of the line on Broad street referred to Sept. 18, and that the work will be completed by the middle of December.

Chicago.—The General Electric Co. has secured a 20-year franchise to lay tracks on Twenty-third and Forty-second streets in Chicago. The road is to be opereted by an underground conduit system. The company has agreed to lay at least two miles of tracks within 18 months after the passage of the ordinance.

Columbia, S. C.—The City Council last week granted the petition of the Columbia Electric Street Railway Co. to make extensive extensions of its line along Richland, Gadsden and other streets and Elmwood avenue. It is reported that the company will add some new rolling stock at an early day.

Connellsville, Pa.—We are informed that the Connellsville Suburban Street Railway Co. is erecting poles and laying the rails for the new electric line between Connellsville and South Connellsville. The line will be completed in a very short time, as there is comparatively little grading to be done, and only two trestles to be built.

Detroit, Mich.—The Detroit Wooden Ware Co. has been granted authority to construct and operate an electric road across White street, in Detroit. No locomotives or large railroad cars will be allowed to run on the tracks.

Hartford, Conn.—The Hartford Street Railway Co. has raised its tracks on each side of the bridge which is being built over Pewter Pot Brook preparatory to laying them across as soon as the bridge is completed.

Lebanon, Pa.—The Lebanon & Annville Street Railway Co. is having its carhouse rebuilt. It will be much larger than the old one, and the contract for the work has been given to Long & Son, Cleona. Col. John B. Embich, of Lebanon, will supervise the work.

Montreal, Can.—An electric road from Montreal to Lachine, which is being built under the direction of the Montreal Park and Island Railway Co., is nearly completed. The section of the road near Lachine connects with the tracks of the Montreal Street Railway Co. at the extreme west end of Notre Dame. The uncompleted section is from Rockfield to St. Aurellie street. The power-house and car-shed, both being built of stone, are well under way at Rockfield. A power-house having two engines, a little larger that the one at Rockfield, is under contract at St. Laurent, and from this point power will be generated for the Mountain, St. Laurent and Black River lines. The rails are of steel and weigh 56 lbs.

New Haven, Conn.—We have been informed that a preliminary survey is in progress for an extensive third rail electric road to connect Torrington, Litchfield, Harwinton and Unionville, with an extension to Bantam Lake, and that the petition to the next Legislature for the road has been already drafted.

Norfolk, Va.—The City Council has granted the Norfolk & Atlantic Terminal Co., which was granted a franchise to operate an electric railroad along certain streets of the city, an extension of 12 months in the time designated to begin the operation of road.

Pittsburgh, Pa.—This week the East Liberty end of the old Citizen's line was abandoned by the Consolidated Traction Co. and run as an electric road from the forks of the road at Thirty-Fourth street.

Quakertown, Pa.—The Richlandtown turnpike has been leased to C. Taylor Leland for an electric road for 10 per cent. per annum on the capital stock of the Turnpike Co. which is $5,000. The Borough Council of Quakertown has granted the trolley company a right of way in the streets of the town. The ordinance provides for the use of flange rails, the tracks are to be laid in the middle of the street and all poles are to be placed at a distance exceeding 20 ft. from the electric-light poles.

San Jose, Cal.—A party of surveyors, under A. T. Herrmann, are at work on the extension of the Alum Rock Railroad, which will run into Alum Rock Park, referred to among our notes Sept. 25. The extension will be about three-quarters of a mile in length and end near the bath-house. The line will run on the west side of the canyon, and an extensive cut and tunnel will be required just beyond the present terminus of the road. The work of construction will commence as soon as the surveying is finished. The cost will be $10,000.

Sedalia, Mo.—We are informed that Edward Wood of Chicago, and others propose to construct an electric road from Monett, Lawrence County, to Sedalia, Mo. If the road is built, branches will run from Leesville to Butler, via Clinton, and from Leesville to Osceola and Stockton.

Waterville, Me.—The company which was recently organized for the purpose of building 3½ miles of road through the towns of Brunswick and Topsham completed the work in 20 days. It is stated that this is but the beginning of a 30-mile line from Bath to Lewiston.

GENERAL RAILROAD NEWS.

Chicago, Milwaukee & St. Paul.—Earnings for September were:

	1896.	1895.	Inc. or dec.	
Gross earn	$2,878,179	$3,082,291	D.	$204,111
Oper. exp. (includ. taxes)	1,867,064	1,736,924	I.	130,140
Net earn	$1,011,114	$1,345,367	D.	$334,252
Three months:				
Gross earn	$7,948,772	$8,034,518	D.	$85,745
Oper. exp. (includ. taxes)	5,271,031	4,930,522	I.	340,509
Net earn	$2,677,740	$3,103,995	D.	$426,254

Greenwood, Anderson & Western.—Application for a Receiver for the company was made in the United States Circuit Court at Charleston, S. C., last week by the attorneys of W. B. Strang, Jr., & Co., of New York, the contractors building the extension of the road from Sievern to Batesburg, S. C. They claim that the railroad company has violated the contract in several ways and that the money for parts of the road already built has not been paid. It is understood that the road claims that the violations of contract have been on the part of Strang & Co. Judge Simmonton issued a rule against the road to show cause, on Nov. 5, why a Receiver should not be appointed.

Jacksonville, Tampa & Key West.—The sale of the road in the suit of the Pennsylvania Company for insurance on lives and granting annuities has been postponed from November 2 to the first Monday in March, 1897, by Judge Locke of the United States Court. The insurance company asked for the adjournment "on account of the disordered condition of the money market." The sale has been previously postponed twice.

Kansas City & Southwestern.—This railroad, a branch of the St. Louis & San Francisco, between Beaumont, Kan., and Arkansas City, which was placed in the hands of a Receiver two weeks ago, has been abandoned. The road is about 100 miles in length.

New York & Northern.—The Court of Appeals of New York has granted the motion of the minority stockholders for a new trial to test the foreclosure of the mortgage held by the Farmers' Loan & Trust Co., under which the New York Central purchased the road. The judgment of foreclosure and sale is reversed and a new trial ordered, to allow the minority stockholders to present to the Court charges that the New York Central road, after purchasing $1,700,000 worth of the stock, purposely aided in forcing the foreclosure and the further charge that the earnings of the road were purposely misapplied so that the foreclosure might be enforced. The lower court decided that it was not illegal on the part of the New York Central to force liquidation, but on the appeal of several of the minority stockholders the case is ordered retried.

Pennsylvania.—The company has just filed its report for the year ending June 30 with the Interstate Commerce Commission. The company's fiscal year ends December 31. The present report shows gross earnings, $65,084,819; operating expenses, $45,064,873; income from operations, $20,019,945; dividend on stock owned, $2,269,746; interest on bonds owned, $1,427,865; miscellaneous income, $854,002; total income from other sources, $4,551,614; total gross income, $24,571,560; net income, $8,170,221; dividend 5 per cent., $6,465,063; surplus June 30, $23,253,147. The company's passenger revenue amounted to $4,866,280, including mail and expense revenue, $17,782,227; total freight revenue, $46,402,675. The reports treats of 53 companies, the capital stock of which aggregates $200,088,000, while the funded debt is $166,650,213, making a total capitalization of $366,738,213, covering a milage of 2,996 miles. The cost of construction, equipment, etc., to January 30 was $115,567,004, the cost per mile being $218,149. The balance sheet showed assets of $276,989,809, an increase of $4,686,725 over the previous year. Included in the liabilities is the profit and loss account of $23,253,147, an increase over last year of $49,915.

Philadelphia & Reading.—The transfer of the properties of the railroad company was made in Philadelphia last week to the purchasers on behalf of the reorganization managers by deed from the Commissioner of sale appointed by the court. It is confidently expected that before the close of the year the new company, which is to be organized as speedily as possible, will be in possession and will begin to operate the property not later than Jan. 1.

Pittsburgh Junction.—The results of the year's operations show an increase in freight receipts over 1895 of $25,260, and in passenger earnings of $152. Operating expenses show an increase of $36,218, and a decrease in net receipts of $10,805. The surplus has decreased $17,801.

Southern.—Earnings for September were:

Month of September:	1896.	1895.	Inc. or dec.	
Gross earn	$1,692,233	$1,650,367	I.	$41,866
Oper. exp. and taxes	1,087,576	1,096,934	D.	9,358
Net earn	$604,657	$553,433	I.	$51,224
From July 1:				
Gross earn	$4,557,910	$4,702,822	D.	$144,912
Oper. exp. and taxes	3,204,468	3,331,590	D.	127,122
Net earn	$1,353,442	$1,371,232	D.	$17,790

Electric Railroad News.

Albany, N. Y.—The Cohoes City Railway has passed out of the hands of the Troy City Railway Co., and will not connect with the latter road. Papers have been signed perfecting the purchase of the Cohoes line solely in the interest of the Albany railroad. Control of the line is to be taken by the new owners immediately. It is the company's intention to run cars through to Cohoes every ten minutes. The line will be connected as soon as the rails can be laid. It is reported that cars will be running through in the early spring.

Chicago.—The West Chicago Street Railroad Co. intends to negotiate a consolidated bond issue, with which to retire the debenture bonds of the company, and pay off its floating debt. The interest charge on $6,000,000 of debentures will be reduced at least 1 per cent. Of the total amount, $4,000,000 will be placed with a trustee to retire the West Chicago Street Railroad first mortgage 5's when they mature, which will not be until 1928. This will leave $6,000,000. Nearly $3,000,000 of debentures have been sold, and by the terms of issuance of a portion of them, they may be redeemed five years after issue. It has been stated that the dividend at the rate of 6 per cent. on the shares of the railroad company will not be reduced, and that the next quarterly dividend of 1½ per cent. will be paid as usual.

Cleveland, O.—The Cleveland & Elyria Electric Railroad and the Cleveland & Berea Electric Railroad have been consolidated, under the name of the Cleveland, Berea & Elyria Railway Co. The Cleveland & Berea was built during the early stages of electric railroad construction, and it was intended to use storage-battery cars. Several experiments were made and found unsatisfactory, and the line was finally equipped with the overhead electric system. When the Cleveland & Elyria was built the tracks of the Berea line were utilized as far as Rocky River, and gradually the ownership of the Cleveland & Berea has passed into the hands of the Elyria, thus bringing about the consolidation. The new company will operate about 30 miles of track, extending from the city limits of Cleveland, on Lorain street, to Elyria, with a branch to Berea. It is proposed to extend the line to Oberlin very shortly. The company has at present in use one power-house located at Rocky River, and has built a new one at Elyria, which will be used for the extension and for increasing the facilities of the present lines.

The officers of the company are: President, A. H. Pomeroy; Vice-President, L. M. Coe; Secretary, H. E. Akins; Treasurer, F. T. Pomeroy. General offices, Garfield Building, Cleveland, O.

New Haven, Conn.—Suit has been brought in the Superior Court by the Derby & New Haven Electric Railroad Co., against the New York, New Haven & Hartford, to have the court determine whether an electric road is needed from Derby to New Haven. The charter of the road was granted in 1893. In 1895 a law was passed making it illegal for an electric road to parallel a steam road, unless the Superior Court declared the electric road a public necessity. It is to determine this point that the suit has been brought.

McKeesport, Pa.—It is reported that the United Traction Co., of Philadelphia, will obtain control of the large system of the Second Avenue Traction Co. in the near future and extend the lines in all directions through Western Pennsylvania.

Washington, D. C.—The bond holders of the Eckington and the Belt Line street car companies, at a meeting held last week, appointed a committee to examine the bill which has been filed against the companies and report result at subsequent meeting to be called.

TRAFFIC.

Traffic Notes.

The injunction suits against freight-rate reductions on Southern railroads seem to have been settled out of court.

The North Carolina Railroad Commissioners have, after two hearings, decided not to enforce their recent order directing a reduction of passenger fares. Press dispatches state that the railroads were able to show that the rates in North Carolina were lower than those in adjoining states.

The new docks of the Illinois Central Railroad at New Orleans have been completed and dedication ceremonies were announced for Oct. 28. Vessels bringing in freight for the Illinois Central will be allowed to use the docks without charge.

Merchants in Montreal are complaining because the Grand Trunk and the Canadian Pacific have ordered freight rates advanced to the winter standard on Nov. 2. The Board of Trade has asked that the summer rates be continued until Nov. 19, or until the close of navigation. The Montreal *Witness* demands that a government railroad commission be established.

The managers of the Joint Traffic Association recommend that all commodity rates be abolished March 31, 1897, and have asked the Central Freight Association, the Middle States Freight Association and the New England roads to take similar action. A very large number of commodity rates are now in force, and as many of them were made simply because some other one had been previously made, the abrogation of the whole at one time would probably leave rival shippers and carriers on the same basis of equality as at present, and therefore work little or no injury to any.

Chicago Traffic Matters.

CHICAGO, Oct. 28, 1896.

The Western Freight Association has been reorganized with a board of administration similar to the Board of Managers of the Joint Traffic Association, but with only five members. The board will be in session in this city daily, Sundays and holidays excepted. For the first board the following have been elected: J. W. Midgley, of the association, Chairman; C. A. Parker, Freight Traffic Manager of the Missouri Pacific; J. A. Monroe, Freight Traffic Manager of the Union Pacific; J. J. Fletcher, General Freight Agent of the Kansas City, Fort Scott & Memphis, and C. L. Wellington, General Freight Agent of the Wisconsin Central.*

The Baltimore & Ohio recently notified the Commissioner of the Central Passenger Committee that it would not redeem return portions of tickets issued on account of voters returning home if purchased by competitors testing the market. The Commissioner has refused to accept the notice and will insist on the Baltimore & Ohio redeeming any tickets so purchased.

The Santa Fe has severed passenger relations with the St. Louis & San Francisco and has entered into through-car arrangements with the Wabash from St. Louis. The latter will run through sleeping-cars in connection with the Santa Fe's limited between St. Louis and San Francisco, commencing Nov. 4.

Figures have been compiled showing the wool shipments from the West to the East via St. Paul and Chicago for the six months ending Sept. 30. The statement shows 23,745 tons to have gone East via Chicago, 19,970 tons going all-rail and 3,775 by lake. From the Northwestern Territory 5,000 tons went by the Soo and Canadian Pacific.

The Chicago & St. Louis Traffic Association has been organized, with Horace Tucker as its chairman. Mr. Tucker will also be Chairman of the Illinois Rate Committee, although the two organizations will be operated separately.

Total eastbound shipments from Chicago by lake last week were 122,292 tons, of which 112,742 tons were grain. Total all-rail shipments were 80,844 tons, compared with 78,905 tons for the preceding week, an increase of 1,939 tons, and against 82,220 tons for the corresponding week of last year. The all-rail shipments by the different lines were:

Roads.	Week to Oct. 24.		Week to Oct. 17.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	9,023	11.2	7,337	9.4
Wabash	7,937	9.8	6,805	8 6
L. S. & M. S.	8,586	10.6	10,047	12.7
Pitts., Ft. Wayne & Chicago	6,907	8.5	8,313	10.6
Baltimore & Ohio	9,792	12.1	8,727	11.1
Pitts., Cin., Chi. & St. Louis	8,710	10.8	5,935	7.5
Grand Trunk	8,720	10.8	9,645	12.2
N. Y. C. & St. L.	8,838	10.9	8,606	10.9
Erie	8,807	10.9	9,852	12.5
C., C., C. & St. Louis	3,524	4.4	3,578	4.5
Totals	80,844	100.0	78,905	100.0

Of the above shipments, 2,715 tons were flour, 41,031 tons grain, 16,694 tons provisions, 9,807 tons dressed beef, 1,875 tons butter, 1,351 tons hides and 4,435 tons lumber.

* See editorial columns for additional particulars.—EDITOR.